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# FIRST APPENDIX

TO THE

# SIXTH EDITION

OF

James Dwight

# DANA'S SYSTEM OF MINERALOGY

BY

EDWARD S. DANA
PROFESSOR OF PHYSICS AND CURATOR OF MINERALOGY YALE UNIVERSITY

COMPLETING THE WORK TO 1899

NEW YORK
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# PREFATORY NOTE.

THIS First Appendix to the Sixth Edition of the System of Mineralogy issued in 1892 is designed to make the work complete up to and including the early part of 1899.

This Appendix contains, first of all, full descriptions of the species announced as new since the publication of the System. There are no fewer than one hundred and sixty names here included, and their place in the general scheme of classification adopted in the System is shown in the classified list given in the Introduction. Unfortunately many of the new names, introduced into the science, during this period, have little claim to recognition, either because of the incompleteness of the original examination or the unsatisfactory nature of the material investigated. On the other hand a considerable part of the descriptions leave nothing to be desired both as regards fullness and accuracy. The relative importance of the new names is approximately indicated by the type used in the classified list.

In addition to the description of new minerals, this Appendix is intended to contain also references to all important papers on mineral species published during the period named; with each reference is given a concise statement of its character, and so far as possible a summary of its contents. Since, however, the additions to mineralogical literature have been very numerous, it has been necessary in order to keep this work within reasonable compass to adhere rigidly to a system of extreme brevity of expression and conciseness of arrangement. All minerals named are, for convenience, placed in alphabetical order.

For an explanation of the *Abbreviations* made use of in the case of periodicals, also of the crystallographical, optical and chemical symbols employed, reference is made to the Introduction to the System (1892), pp. xlv–li, and pp. xiii–xl. General abbreviations are explained on pp. lxi–lxiii.

The Bibliography includes the full titles of prominent volumes published since 1891. In addition attention is called to the large number of important memoirs on physical subjects, recently issued, particularly those on the molecular structure of crystals as related to the symmetry of form by Fedorow, Schönflies, Goldschmidt, Barlow, Viola, and others. These and other related papers will be found either in full or as abstracts in Groth's invaluable *Zeitschrift für Krystallographie und Mineralogie*, vols. 20–30 inclusive.

The thanks of the author are due to his colleagues, Prof. S. L. Penfield and L. V. Pirsson. The former has had the kindness to furnish brief accounts of some new species now for the first time publicly described.

NEW HAVEN, June 1, 1899.

# INTRODUCTION.

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# CLASSIFIED LIST OF NEW NAMES.

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## I. NATIVE ELEMENTS, Min. pp. 2–32.

**Josephinite** (p. 33), $Fe_2Ni_5$. Near Awaruite, Min. p. 29.
Graphitite (p. 31). Var. Graphite, Min. p. 7.

## II. SULPHIDES, TELLURIDES, ARSENIDES, ETC., Min. pp. 33–108.

**Grünlingite** (p. 31), $Bi_4TeS_3$. Near Tetradymite, Min. p. 39.
Quirogite (p. 58). An impure Galena, Min. p. 48 ?
Heazlewoodite (p. 33), Folgerite (p. 52). Essentially Pentlandite, Min. p. 65.
Gunnarite (p. 31), $Fe_3Ni_2S_4$ ? Near Pentlandite.
**Hauchecornite** (p. 33), $(Ni,Co)_7(S,Bi,Sb)_8$. Near Polydymite, Min. p. 75.
**Barracanite**, Cupropyrite (p. 21). Near Cubanite, Min. p. 79.
Blueite (p. 56), Whartonite (p. 56). Same as Pyrite, Min. p. 84.
**Willyamite** (p. 73), $CoSbS.NiSbS$. Near Ullmannite, Min. p. 91.
**Bismutosmaltite**, **Nickel-skutterudite** (p. 63). Varieties of Skutterudite, Min. p. 98.
**Goldschmidtite** (p. 30), $Au_2AgTe_6$. Near Sylvanite, Min. p. 103.
**Kalgoorlite** (p. 33), $HgAu_2Ag_6Te_6$.

## III. SULPHO-SALTS, Min. pp. 109–151.

### 1. Sulpharsenites, Sulphantimonites, etc.

**Andorite**, Webnerite, Sundtite (p. 4), $2PbS.Ag_2S.3Sb_2S_3$. Related to Zinkenite Group, Min. p. 111.

**Lorandite** (p. 43), $Tl_2S.As_2S_3$. Near Miargyrite, Min. p. 116.

**Pearceite** (p. 50), $9Ag_2S.As_2S_5$. Near Polybasite, Min. p. 146.

**Rathite** (p. 58), contains S,As(Sb),Pb. Related to Dufrenoysite, Min. p. 120, and Jamesonite, p. 122.

### 2. Sulphostannates.

**Canfieldite** (p. 13), $4Ag_2S.(Sn,Ge)S_2$. Near Argyrodite, $4Ag_2S.GeS_2$, p. 6, and Min. p. 150.
**Cylindrite**, Kylindrit (p. 21), $6PbS.Sb_2S_3.6SnS_2$.
**Franckeite** (p. 26), $5PbS.Sb_2S_3.2SnS_2$.

## IV. CHLORIDES, BROMIDES, IODIDES, Min. pp. 152–182.

### 1. Anhydrous Chlorides, etc.

**Marshite** (p. 45), $Cu_2I_2$. In Group with Nantokite, p. 154.
**Miersite** (p. 47), $Ag_2I_2$. " " " " "
**Cupro-iodargyrite** (p. 21), $CuI.AgI$ or $Cu_2I_2.Ag_2I_2$.

### 2. Oxychlorides.

**Paralaurionite** (p. 50), $PbCl_2.Pb(OH_2)_2$. Near Laurionite, p. 171.
**Penfieldite** (p. 51), $PbO.2PbCl_2$.

CUMENGITE, PSEUDOBOLÉITE (p. 52). Near Percylite and Boléite, Min. pp. 172 and 1028.
METANOCERINE (p. 46). Near Nocerite, Min. p. 174?

## V. OXIDES, Min. pp. 183–260.

QUARTZINE, LUTÉCINE, LUTÉCITE (p. 58). Near Quartz, Min. p. 183.
Cubaite, Guanabaquite, Guanabacoite (p. 58). Same as Quartz.
MITCHELLITE (p. 17). Var. Chromite (Magnochromite), Min. p. 228.
**Baddeleyite**, Brazilite (p. 8), $ZrO_2$.
Dicksbergite (p. 23). Same as Rutile, Min. p. 237.
Mesabite (p. 30). Var. Göthite, Min. p. 247.
Schulzenite (p. 61). Near Asbolite, Min. p. 258.

**Geikielite** (p. 28), $MgO.TiO_2$.
**Bixbyite** (p. 10), $FeO.MnO_2$.
**Senaite** (p. 61), $(Fe,Pb)O.2(Ti,Mn)O_2$.
**Zirkelite** (p. 75), $(Ca,Fe)O.2(Zr,Ti,Th)O_2$.
The above may properly be placed with the Titanates (Manganates, Zirconates).

## VI. I. CARBONATES, Min. pp. 261–309.

**Northupite** (p. 49), $MgCO_3.Na_2CO_3.NaCl$.
**Pirssonite** (p. 58), $CaCO_3.Na_2CO_3.2H_2O$.
KTYPEITE (p. 39), $CaCO_3$.
Hydrocalcite (p. 36).
Taraspite (p. 67). Var. Dolomite, Min. p. 271.
Calcistrontite (p. 13). A mixture of Calcite and Strontianite.

## VI. 2. SILICATES.

### A. ANHYDROUS SILICATES, Min. pp. 310–562.

**Epididymite** (p. 24), $HNaBeSi_3O_8$. Near Eudidymite, Min. p. 313.
**Celsian** (p. 15), $BaAl_2Si_2O_8$. Barium Feldspar, near Anorthite, Min. p. 337.
**Urbanite**, Lindesite (p. 70), $(Ca,Mg)SiO_3 + 2Na\overset{III}{Fe}(SiO_3)_2$. Pyroxene Group, Min. p. 314.
FEDOROVITE (p. 57). Bet. Ægirite-augite and Ægirite, Pyroxene Group, Min. p. 344.
**Hainite** (p. 31), contains Ti, Zr, Na, Ca. Related to Låvenite, p. 375, Wöhlerite, Min. p. 376, etc.
HASTINGSITE (p. 3), PHILIPSTADITE (p. 3), Xiphonite (p. 3). Referred to Amphibole, Min. p. 385.
RHODUSITE (p. 29). Near Glaucophane, Min. p. 399.
CATAPHORITE (p. 14). Bet. Arfvedsonite and Barkevikite, Min. pp. 401, 403.
CROSSITE (p. 20). Bet. Glaucophane and Riebeckite, Min. pp. 399, 400.
VALLÉITE (p. 71). Near Anthophyllite, Min. p. 384.
**Elpidite** (p. 24), $H_6Na_2ZrSi_6O_{18}$. Related to Catapleiite, Min. p. 412.
**Hardystonite** (p. 32), $Ca_2ZnSi_2O_7$. Near Ganomalite, Min. p. 422?
**Nasonite** (p. 48), $(Ca,Pb)_{10}Cl_2Si_6O_{21}$.
RHODOLITE (p. 28), LAGORIOLITE (p. 28). Varieties of Garnet, Min. p. 437.
Ransätite (p. 28). Same as Garnet (spessartite), Min. p. 442.
**Glaucochroite** (p. 29), $CaMnSiO_4$. Chrysolite Group, Min. p. 449.
Iddingsite (p. 36). Probably an altered Chrysolite, p. 451.
**Fuggerite** (p. 27). Near Gehlenite, Min. p. 476.
MANGANANDALUSITE (p. 4), MALTESITE (p. 4). Varieties of Andalusite, Min. p. 496.
**Thalenite** (p. 68), $H_2Y_4Si_4O_{15}$. Near Yttrialite, Min. p. 512.
CLINOZOISITE, Klinozoisit (p. 17). Calcium-epidote (monoclinic), Min. p. 516.
**Hancockite** (p. 32), contains Si, Pb, Ca, Sr, Al, $\overset{III}{Fe}$. Epidote Group?
**Prolectito** (p. 55), probably $Mg[Mg(F,OH)]SiO_4$. Humite Group, Min. p. 535.

**Clinohedrite** (p. 17), $H_2ZnCaSiO_4$. Near Calamine, Min. p. 546.
**Lawsonite** (p. 41), $H_4CaAl_2Si_2O_{10}$. Near Carpholite, Min. p. 549.
**Roeblingite** (p. 60), $5H_2CaSiO_4.2CaPbSO_4$.
COSMOCHLORE, Kosmochlor, Kosmochromit (p. 20). A chromium silicate.

### B. OTHER SILICATES, CHIEFLY HYDROUS SPECIES, Min. pp. 562–711.

**Wellsite** (p. 72), $RAl_2Si_3O_{10}.3H_2O$. Phillipsite Group, Min. p. 579.
**Erionite** (p. 25), $H_2CaK_2Na_2Al_2Si_6O_{17} + 5H_2O$.
**Gonnardite** (p. 30), $(Ca,Na_2)_2Al_2Si_5O_{15} + 5\frac{1}{2}H_2O$.
METADESMINE (p. 65). Near Stilbite, Min. p. 583.
METASCOLEZITE (p. 61). Near Scolezite, Min. p. 604.
LEMBERGITE (p. 42), $5Na_2Al_2Si_2O_8 + 4H_2O$.
BADDECKITE (p. 7). Near Muscovite, Min. p. 614.
Caswellite (p. 14). Altered mica.
BEACONITE (p. 66). Var. Talc, Min. p. 678.
PSEUDOPYROPHYLLITE (p. 56). Near Pyrophyllite, Min. p. 691.
HOEFERITE (p. 35), $2Fe_2O_3.4SiO_2.7H_2O$. Near Chloropal, Min. p. 701.
ALEXANDROLITE (p. 7), contains $H_2O,Al_2O_3,Cr_2O_3,SiO_2$.
BATAVITE (p. 9), contains $H_2O,MgO,Al_2O_3,SiO_2$.
Taylorite (p. 67). A clay.
Weldite (p. 72), contains $SiO_2$, $Al_2O_3$, $Na_2O$.

### TITANO-SILICATES, TITANATES, Min. pp. 711–724.

LAMPROPHYLLITE (p. 40). Near Astrophyllite, Min. p. 719 ?
**Neptunite** (p. 49). Near Titanite, p. 712.
**Knopite** (p. 39). Near Perovskite and Dysanalyte, Min. pp. 722, 724.

Other Titanates are mentioned on the preceding page.

### VI. 3. NIOBATES, TANTALATES, Min. pp. 725–746.

**Mossite** (p. 48), $Fe(Nb,Ta)_2O_6$. Near Tapiolite, p. 738.
STIBIOTANTALITE, $Sb_2O_3.(Ta,Nb)_2O_5$ ?

### VI. 4. PHOSPHATES, ARSENATES, ETC., Min. pp. 747–861.

**Adelite** (p. 1, also Min. p. 1052), $(MgOH)CaAsO_4$. Wagnerite Group, Min. p. 775.
**Tilasite** (p. 68), Fluor-adelite, $(MgF)CaAsO_4$. " " " "
MANGANBERZELIITE (p. 10). Near Berzeliite (Pyrrharsenite), Min. 753.
Rhodophosphite (p. 59). Same as Apatite, Min. p. 762 ?
**Retzian** (p. 59). Basic arsenate of manganese, etc.
Gersbyite (p. 28). Near Lazulite, Min. p. 798.
HAUTEFEUILLITE (p. 33), $(Mg,Ca)_3P_2O_8 + 8H_2O$. Near Bobierrite, Min. p. 817.
**Wardite** (p. 71), $2Al_2O_3.P_2O_5.4H_2O$.
MINERVITE (p. 47), $Al_2O_3.P_2O_5.7H_2O$.
Utahlite (p. 71). Same as Variscite, Min. p. 824.
KEHOEITE (p. 38), $ZnO.4Al_2O_3.5P_2O_5.9H_2O$.
**Carnotite** (p. 13), $K_2O.2U_2O_3.V_2O_5.3H_2O$.

The following are imperfectly described arsenates, or antimonates, of manganese or iron, or both :

Basiliite (p. 9), Chloroarsenian (p. 16), Chondrostibian (p. 17), Elfstorpite (p. 24), Lamprostibian (p. 40), Magnetostibian (p. 44), Melanostibian (p. 44), Rhodoarsenian (p. 59), Sjögrufvite (p. 62).

### ANTIMONATES, Min. pp. 861–866.

**Tripuhyite** (p. 70), $2FeO.Sb_2O_5$.
**Derbylite** (p. 22), $6FeO.5TiO_2.Sb_2O_5$.

**Lewisite** (p. 42), $5CaO.2TiO_2.3Sb_2O_5$.
**Mauzeliite** (p. 45), $4(Ca,Pb)O.TiO_2.2Sb_2O_5$.

### Phosphates (Arsenates) with Sulphates, Min. pp. 866–869.

**Lossenite** (p. 44), $2PbSO_4.3(FeOH)_3A_2O_8 + 12H_2O$.
Munkforssite (p. 48). Near Svanbergite, Min. p. 868.
Munkrudite (p. 48). " " " "

### VI. 5. BORATES, Min. pp. 874–889.

**Ascharite** (p. 6), $3Mg_2B_2O_5.2H_2O$.
**Sulphoborite** (p. 65), $4MgHBO_3.2MgSO_4.7H_2O$.

### Uranates, Min. pp. 889–893.

**Mackintoshite** (p. 44), $UO_3.3ThO_2.3SiO_2.3H_2O$. Near Thorogummite, Min. p. 893.

### VI. 6. SULPHATES, CHROMATES, Min. pp. 894–981.

**Langbeinite** (p. 40), $K_2SO_4.2MgSO_4$.
**Dietzeite** (p. 23), $7Ca(IO_3)_2.8CaCrO_4$.
Beresovite (p. 9), $6PbO.3CrO_3.CO_2$.
Salvadorite (p. 60), $(Cu,Fe)SO_4 + 7H_2O$. Near Pisanite, Min. p. 943.
Siderotil (p. 62), $FeSO_4 + 5H_2O$.
**Leonite, Kaliblödite, Kaliastrakanite** (p. 42), $K_2SO_4.MgSO_4 + 4H_2O$. Near Blödite, Min. p. 946.
Seelandite (p. 61). Near Pickeringite, Min. p. 953.
Masrite (p. 45). An alum near Halotrichite, Min. p. 954.
Kamarezite (p. 33), $(CuOH)_2SO_4.Cu(OH)_2.6H_2O$. Near Langite, Min. p. 961.
Planoferrite (p. 54), $Fe_2O_3.SO_3.15H_2O$.
Idrizite (p. 36). Near Botryogen, Min. p. 972.
Cubeite, Kubeit (p. 21), contains $SO_3,Fe_2O_3,MgO,H_2O$.
Kauaiite (p. 38), contains $SO_3,Al_2O_3,K_2O,Na_2O,H_2O$.
Bouglisite (p. 4). A mixture of anglesite and gypsum.

### VI. 7. TUNGSTATES, MOLYBDATES, Min. pp. 982–995.

**Raspite** (p. 58), $PbWO_4$. Wolframite Group, Min. p. 982 ?

### VIII. HYDROCARBON COMPOUNDS, Min. pp. 996–1024.

Alexjejevite (p. 2), Allingite (p. 2), Burmite (p. 12), Cedarite (p. 14). All near Succinite and Amber, Min. p. 1002.
Courtzilite (p. 20). Same as Uintahite, Min. p. 1020.
Pelionite (p. 51), Var. Cannel Coal.
Libollite (p. 43). Near Albertite, Min. p. 1020.
Tiffanyite (p. 68). Undetermined hydrocarbon.

# APPENDIX I.

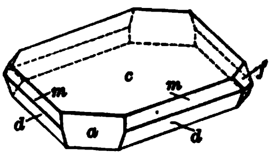
**Acanthite**, p. 58.—Crystals of silver sulphide, prismatic and apparently orthorhombic, occur at the Enterprise mine, Rico, Colorado. Chester, School Mines Q., **15**, 303, 1894.

Wire-like forms from Guanajuato, Mexico, referred to acanthite, have been analyzed by Genth, Am. J. Sc., **44**, 383, 1892.

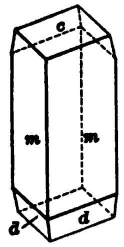
**Adelite**, p. 1052.—The following is a full description, Hj. Sjögren, G. För. Förh., **13**, 781, 1891; Bull. G. Inst. Upsala, **1**, 56, 1892:

Monoclinic. Crystals rare, tabular ∥ *c* or prismatic (*m*). (Figs. 1, 2.) Observed forms: *a* (100), *c* (001), *m* (110), *f* (011), *d* ($\bar{2}21$). Measured angles: *ac* = 73° 15′, *mm‴* (110 ∧ $1\bar{1}0$) = 87° 5′[*]?, *m d* ($\bar{1}10$ ∧ $\bar{2}21$) = 24° 45′; a relation to wagnerite is suggested (see foot-note). Usually massive, in embedded grains.

1.



2.



Cleavage none. Fracture conchoidal to uneven. H. = 5. G. = 3·71–3·76. Luster resinous to greasy. Color gray, yellowish gray. Translucent. Optically +. $Bx_a \wedge \dot{c} = +33° 45′$. Axial angle large, 2E = 106° 40′, also $2K_{ay}$ = 58° 47′ ($n = 1·6703$); $\rho > v$.

Composition, $HCaMgAsO_5$ or $(MgOH)CaAsO_4$, analogous to the wagnerite group (p. 775). Analyses, R. Mauzelius, quoted by Sjögren:

| | G. | $As_2O_5$ | CaO | MgO | BaO | PbO | CuO | FeO | MnO | $H_2O$ | Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Nordmark | 3·71 | 50·04 | 25·43 | 17·05 | *tr.* | 0·39 | — | — | 1·64 | 4·25 | 0·24 |
| | | | | | | | | [$Fe_2O_3,Al_2O_3$ 0·30 | | | Cu 0·26 = 99·60 |
| 2. Långban | 3·76 | 50·28 | 24·04 | 17·90 | 0·23 | 2·79 | 0·32 | 0·08 | 0·48 | 3·90 | *tr.* = 100·02 |
| 3. Jakobsberg | 3·72 | 48·52 | 23·13 | 19·25 | — | 2·41 | — | 0·09 | 1·27 | 3·99 | $SiO_2$ 1·88=100·54 |

Fuses easily B. B. to a gray enamel. With soda on charcoal yields arsenical fumes. Soluble in dilute acids. The water goes off completely only at a high temperature.

Occurs with grains of magnetite and scales of native copper at the Kittel mine, Nordmark, Sweden; also at the Jakobsberg mine with hausmannite, etc., in limestone; with other arsenates and manganese minerals at Långban. Named from ἄδηλος, *indistinct*.

A related mineral from the Moss mine gave Lundström (quoted by Sjögren, G. För. Förh., **7**, 412, 1884, Upsala, p. 60): $As_2O_5$ 49·73, CaO 25·52, MgO 18·98, BaO 0·81, MnO 1·69, ZnO ? 0·08, $Al_2O_3,Fe_2O_3$ 0·83, loss ($H_2O$) 2·36 = 100. Its character is somewhat uncertain.

See also *Tilasite*, which is a *fluor-adelite*, $(MgF)CaPO_4$.

**Ægirite**, pp. 364, 1046.—Reported as occurring in the nephelite-syenite of Paisano Pass, Davis Mts., Texas, A. Osann, 4 Ann. Rep. Geol. Surv. Texas, 128, 1892. Noted also in rocks at various points, as Salem, Mass.; Cripple Creek, Colo.; Black Hills; Bearpaw Mts., Judith Mts. and Crazy Mts., Montana.

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[*] The author's angles and axes are hopelessly at variance. He calculates $\dot{a} : \dot{b} : \dot{c}$ = 1·0989 : 1 : 1·5642, $\beta$ = 73° 15′. This ratio for $\dot{a} : \dot{b}$ requires, however, *mm‴* (110 ∧ $1\bar{1}0$) = 92° 55′, not 87° 5′ as stated; also the value 92° 55′ gives the author's angle *cm* = 78° 33′. Furthermore he gives $\bar{1}10$ ∧ $\bar{2}21$ = 24° 45′ and 001 ∧ $\bar{2}21$ = 75° 27′ (76° 26′ meas.), but 001 ∧ $\bar{1}10$ = 101° 27′, hence 001 ∧ $\bar{2}21$ should be 76° 42′. The value of $\dot{c}$ deduced from the author's fundamental angles (using 110 ∧ $1\bar{1}0$ = 92° 55′) is 0·8799, *not* 1·5642; but the measured angles, *ca* = 73° 15′ and *cf* = 56° 27′, give $\dot{c}$ = 1·5748.

**Ænigmatite**, p. 403.—An amphibole occurring in the "heumite" of Heum, Norway, may belong here, cf. Brögger, Eruptivgesteine d. Krist., 3, 93, 1898. Reported as occurring in Texas, see ægirite.

Investigation of etching-figures, R. A. Daly, Proc. Am. Acad. Sc., 34, 425, 1899.

**Agricolite**, p. 448.—From near Schwarzenberg, Saxony, Frenzel, Min. petr. Mitth., 16, 528, 1896.

**Aguilarite**, p. 1025.—Several analyses have been made by Genth on material from the original locality; the purest yielded: Se 18·96, S 5·93, Ag 79·41, Cu 0·50 = 99·80. Dodecahedral crystals gave the composition of argentite, with Se = 3·75 (S : Se = 7 : 1). Other crystals were partially altered to stephanite, etc. Am. J. Sc., 44, 381, 1892.

**Alabandite**, p. 64.—Occurs at Tombstone, Arizona, in large but rough twinned cubic crystals with tetrahedral faces; G. = 4·031, 4·040; analysis gave (Volckening): S 36·91, Mn 63·03 = 99·94. Moses and Luquer, Sch. Mines Q., 13, 236, 1892; Moses, Zs. Kr., 22, 18, 1893.

**Albite**, pp. 327, 1025.—On crystals from Revin, Belgium, see Franck, Bull. Acad. Belg., 21, 603, 1891.

Crystallographic and optical investigation of a variety free from calcium from Lakous, Crete, Viola, Min. petr. Mitth., 15, 135, 1895, Zs. Kr., 30, 423, 436, 1898. Same of varieties from Russian localities, Glinka, Zs. Kr., 22, 63, 1893; 26, 509, 1886; Vh. Min. Ges., 31, 1, 1894.

Cleavage and parting investigated, Penfield, Am. J. Sc., 48, 115, 1894.

Etching-figures, T. L. Walker, Am. J. Sc., 5, 182, 1898.

See also *Feldspar*.

**Alexandrolite.** *S. M. Losanitsch*, Ber. Chem. Ges., 28, 2631, 1895, and Chem. News, 69, 243, 1894.—See *Avalite*.

**Alexjejevite.** A resin from the Kaluga Govrn., Russia. Composition: C 75·5, H 12·5, O 12·0. Investigated by Alexjejev (Vh. Min. Ges. St. Pet., 29, 201, 1892) and named by Karnojitsky, Zs. Kr., 24, 504, 1895.

**Allanite**, p. 522.—Crystals described from Franklin Furnace, N. J., Eakle, Am. J. Sc., 47, 436, 1892; also from the Harz (*orthite*), Luedecke, Min. d. Harzes, 444, 1896; from Mineville, Essex Co., N. Y., H. Ries, Trans. N. Y. Acad. Sc., 16, 327, 1897.

Forms about 56 p. c. of a granite on the east shore of Lac à Baude, Champlain Co., Quebec. Hoffmann, Rep. G. Canada, 7, 12 R, 1894.

**Allingite.** *E. Aweng* [Arch. Pharm., 232, 1894]. Jb. Min., 2, 254 ref., 1896. A fossil resin from Switzerland, related to succinite.

**Allophane**, p. 693.—Analyses of Italian varieties, G. D'Achiardi, Att. Soc. Tosc., Proc. Verb., March 13, 1898.

**Alstonite.**—See *Bromlite*.

**Altaite**, p. 51.—Occurs near Liddle Creek, West Kootanie, Br. Columbia, Hoffmann, Rep. G. Canada, 6, 29R, 1893; also on Long lake, Yale district, B. C. (anal. by Johnston), *ibid.*, 8, 11 R, 1895; at Choukpazat, Upper Burma, Louis, Min. Mag., 11, 215, 1897.

**Alunite**, p. 974.—Occurs at Tres Cerritos, Mariposa Co., California, in an alunite-quartzite, Turner, Am. J. Sc., 5, 424, 1898. At Red Mountain, Ouray Co., Colorado, in aggregations of minute crystals with enargite, etc. Analysis; $SO_3$ 38·93, $Al_2O_3$ 39·03, $K_2O$ 4·26, $Na_2O$ 4·41, $H_2O$ 13·35, insol. 0·50 = 100·48. E. B. Hurlburt, Am. J. Sc., 48, 130, 1894. From Knickerbocker Hill, Custer Co., Colo., anal., Eakins, Bull. U. S. G. Surv., 90, 62, 1892.

**Alurgite**, p. 635.—The deep-red manganese mica from St. Marcel, Piedmont, has been analyzed by Penfield, as follows·

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | $Mn_2O_3$ | $MnO$ | $MgO$ | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|
| 53·22 | 21·19 | 1·22 | 0·87 | 0·18 | 6·02 | 11·20 | 0·34 | 5·75 = 99·99 |

For this the formula preferred is $HR_2(AlOH)Al(SiO_3)_4$ with R = MgOH.K chiefly; it is thus distinct from other species of the mica group. It is monoclinic; cleavage basal; laminæ flexible. H. = 3. G. = 2·835–2·849. Not highly pleochroic. $2E_y$ = 56° 5′–57°. Am. J. Sc., 46, 288, 1893.

**Amber.**—See **Succinite**; also the new names, *Allingite*, *Burmite*, *Cedarite*, etc.

**Amphibole**, pp. 385, 1026.—K. von Kraatz divides the varieties here included into three groups according to prismatic cleavage angle: Tremolite series, cleavage angle 55° 10′ to 55° 25′; common green hornblende, 55° 25′ to 55° 35′; brown basaltic hornblende, 55° 40′ to 55° 50′. Zs. Kr., **30**, 664, 1899.

A discussion of the variation of extinction-angle in the prismatic zone is given by R. A. Daly, Proc. Am. Acad. Sc., **34**, 311, 1899. See also by the same author an exhaustive investigation of etching-figures of different members of the amphibole group, *ibid.*, p. 374 (see *philipstadite* below).

On the composition of certain rock-making amphiboles, from the Sierra Nevada, California, see Turner, Am. J. Sc., **7**, 297, 1899. Analysis (2·72 $H_2O$) of amphibole from the Durbach mica-syenite, Sauer, Beitr. G. Heidelberg, Mitth. Bad. G. Landesanst., **2**, 252. Analyses are given also in many petrographical memoirs, Jahrb. Min., *et al.*

Synthetic experiments leading to the formation of this and other species, Doelter, Jb. Min., **1**, 1, 1897.

An unusual variety (monoclinic-hemihedral or triclinic?) occurs in the trachyte of Montesanto, Italy, Franco, Zs. Kr., **25**, 328, 1895; Rend. Accad. Napoli, May–June, 1895.

An amphibole having the composition of an orthosilicate analogous to garnet, $(\overset{\text{I}}{R}_2,\overset{\text{II}}{R})_3\overset{\text{III}}{R}_2Si_3O_{12}$ (cf. syntagmatite, Min., p. 388), has been called *hastingsite* by Adams and Harrington (Am. J. Sc., **1**, 210, 1896). Occurs in grains in the nephelite-syenite of Dungannon, Hastings Co., Ontario. Optically −. Birefringence low. $\mathfrak{c}$ nearly coincident with ċ. Ax. pl. ‖ *b* (010). Ax. angle small, 30° to 45°. Dispersion $\rho > v$. Absorption $\mathfrak{c} = \mathfrak{b} > \mathfrak{a}$. Pleochroism, $\mathfrak{a}$ yw.-green; $\mathfrak{b}$ and $\mathfrak{c}$ deep bluish green. Analysis, Harrington:

| | $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G. = 3·433 | 34·18 | 1·53 | 11·52 | 12·62 | 21·98 | 0·68 | 9·87 | 1·35 | 2·28 | 3·29 | 0·35 = 99·60 |

Another aluminous amphibole, from the gabbro of Pavone, near Ivrea, Piedmont, Italy, investigated by Van Horn is also nearly an orthosilicate. Cleavage-angle 55° 42′. G. = 3·217–3·222. Extinction-angle 14° 30′ to 15° 30′ on *b* (010). Pleochroism strong: $\mathfrak{a}$ light yellow; $\mathfrak{b}$ brown, tinge of red; $\mathfrak{c}$ brown, tinge of yellow. Analysis by Dittrich:

| $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 39·58 | *tr.* | 14·91 | 4·01 | 10·67 | *tr.* | 11·76 | 13·06 | 0·62 | 2·87 | 2·79 = 100·27 |

This corresponds nearly to $\overset{\text{II}}{R}_5\overset{\text{III}}{R}_2Si_4O_{16}$ or $\overset{\text{II}}{R}_3\overset{\text{III}}{R}_2Si_3O_{12}$ (syntagmatite) + $\overset{\text{II}}{R}_2SiO_4$. Amer. Geol., **21**, 370, 1898.

An amphibole from Philipstad, Sweden, has been called *philipstadite* by R. A. Daly (Proc. Am. Acad. Sc., **34**, 433, 1899). It shows anomalous etching-figures on *m* (110) and *b* (010) (*ibid.*, p. 399); pronounced zonal structure; small optic axial angle (about 50°); also unusual pleochroism and absorption: viz., $\mathfrak{a}$ light brownish green, $\mathfrak{b}$ dark yellow-green, $\mathfrak{c}$ dark blue-green; $\mathfrak{b} > \mathfrak{c} > \mathfrak{a}$. It is optically −, with an extinction-angle on *b* (010) with ċ = + 15° 9′ (Na). An analysis by Pisani gave:

| $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | CaO | MgO | $Na_2O$ | $K_2O$ | ign. |
|---|---|---|---|---|---|---|---|---|---|---|
| 45·20 | 0·84 | 7·34 | 7·55 | 15·80 | 1·52 | 12·30 | 8·40 | 0·80 | 0·37 | 0·70 = 100·82 |

*Xiphonite* is a name given by G. Platania (Accad. Sc. Acireale, **5**, 1893) to a variety occurring in minute crystals with hematite in cavities of a slag-like rock at Acicatena (Etna), Sicily. Form, angles and cleavage like amphibole, but characterized by light honey-yellow color and by feeble pleochroism. Composition undetermined. Named from Xiphonia, an old town near the locality.

See *Richterite* (astochite); also other species of the group; new names are *Cataphorite* (Kataforite), *Crossite*, *Rhodusite*.

**Analcite**, p. 595.—Crystals described from the Harz, Luedecke, Min. d. Harzes, 576, 1896. Also from Boylestone Quarry, near Barrhead, Renfrewshire, Scotland; doubtful forms *z* (543), *t* (421), also (332). Heddle, Trans. Edinb. G. Soc., **7**, 241, 1897.

Optical structure investigated, Monte Somma, P. Franco, Giorn. Min., **3**, 232, 1892. Same, from Monte Catini, G. D'Achiardi, Att. Soc. Tosc., Pisa, 1897. Discussion of optical structure, with relation to a new artificial silicate, G. Friedel, Bull Soc. Min., **19**, 14, 5, 1896; also with reference to effect produced by loss of water, *ibid.*, pp. 94, 363. Further discussion of optical structure, especially in relation to leucite, Klein, Ber. Ak. Berlin, 290, 1897, and Jb. Min., Beil.-Bd., **11**, 474, 189.

Analysis, from Friedersdorf on the Lahn, Brauns, Jb. Min., **2**, 4, 1892. From the Plauenschen Grund, Dresden, Zschau, Abh. Ges. Isis, p. 94, 1893.

Occurs in a dike-rock at Hamburg, N. J., derived from leucite, Kemp, Am. J. Sc., **45**, 298, 1893. Also in analcite-diabase of San Luis, California, Fairbanks, Bull. Dept. Geol. Univ. California, **1**, 273, 1895.

Present as a primary constituent in certain igneous rocks (monchiquite), Pirsson, J. Geol., **4**, 679, 1896; also in an analcite-basalt near Cripple Creek, Colorado, Cross, J. Geol., **5**, 684, 1897.

**ANATASE.**—See *Octahedrite.*

**ANDALUSITE**, p. 496.—Crystals from the Pitzthal, Tyrol, show the new forms, *i* (320), *t* (013), *v* (054), *u* (032), *x* (112). Haefele, Zs. Kr., 23, 551, 1894.

A variety of chiastolite from the crystalline schists of the region north of Ladoga Lake in eastern Finland is called *maltesite* by J. J. Sederholm. The large nodules show a Maltese cross of wedge-shaped parts of pure material, separated by areas of impure material. G. För. Förh., 18, 390, 1896.

A variety containing 6·91 p. c. $Mn_2O_3$ is called *Manganandalusite* by H. Bäckström. Occurs in muscovite-quartzite of Vestanå, Sweden, differs from ordinary andalusite in its grass-green color and strong pleochroism: $\mathfrak{c}$ ($\breve{a}$) and $\mathfrak{b}$ ($\bar{b}$) blue-green, $\mathfrak{a}$ ($\dot{c}$) pure yellow and most absorbed.

Investigation of a mineral related to andalusite and dumortierite, from the granite of the Argentine Republic. It is marked by deep-red pleochroism. Romberg, Jb. Min., Beil.-Bd., 8, 340, 1893.

See also *Westanite.*

**ANDESINE**, p. 333.—Stenzelberg, Siebengebirge, crystals described (new form, $1\bar{3}0$), Busz, Jb. Min., 1, 36, 1898. See also *Feldspar.*

**Andorite.** *J. A. Krenner* [Math. term. Értesitö, 11, 119, 1892], Zr. Kr., 23, 497, 1894; *G. T. Prior* and *L. J. Spencer*, Min. Mag., 11, 286, 1897; and Zs. Kr., 29, 346. Sundtite, *W. C. Brogger*, Zs. Kr., 21, 193, 1893; *Pöhlmann, ibid.*, 24, 124, 1894. Webnerite, *Stelzner, ibid.*, 24, 125, 1894.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c} = 0·6772 : 1 : 0·4458$. $100 \wedge 110 = 34° 6\frac{1}{2}'$, $001 \wedge 101 = 33° 21\frac{1}{2}'$, $001 \wedge 011 = 24° 1\frac{1}{2}'$. Forms: *a* (100), *b* (010), *c* (001); *φ* (610), *ψ* (510), *n* (210), *o* (320), *m* (110), *l* (230), *k* (120); *h* (102), *θ* (305), *σ* (203), *κ* (405), *f* (101), *e* (302), *λ* (301), *μ* (902); *x* (011), *ν* (043), *π* (032), *γ* (021), *y* (031); *υ* (112), *χ* (223), *p* (111), *s* (332), *q* (221), *ρ* (331); *s* (211), *δ* (364), *r* (121), *ϵ* (362); *ω* (132); *β* (131); *α* (162); *ζ* (2·21·7). Angles: $mm''' = 68° 12'$, $ff' = 66° 43'$, $xx' = 48° 3'$, $yy' = 106° 26'$, $vv' = {}^*35° 37\frac{1}{2}'$, $vv''' = {}^*23° 54\frac{1}{2}'$.

In aggregates of highly modified prismatic crystals, tabular ‖ *a* (100); faces in prismatic zone vertically striated. Also massive.

Cleavage none. Fracture conchoidal. Brittle. H. = 3–3·5. G. = 5·50. Luster metallic, brilliant. Color steel-gray. Streak black.

Composition, $PbAgSb_3S_6$ or $2PbS.Ag_2S.3Sb_2S_3$. Analyses.—1, Loczka; quoted by Krenner. 2, 3, G. T. Prior. 4, P. J. Mann, quoted by Stelzner (also other anals. on less pure material).

| | G. | S | Sb | Pb | Ag | Cu | Fe |
|---|---|---|---|---|---|---|---|
| 1. Felsöbanya | 5·341 | 23·32 | 41·91 | 22·07 | 11·31 | 0·69 | 0·70 insol. 0·04 = 100·04 |
| 2. " | 5·33 | 22·19 | 41·76 | 21·81 | 11·73 | 0·73 | 1·45 = 99·67 |
| 3. Oruro | 5·377 | 22·06 | 41·31 | 24·10 | 10·94 | 0·68 | 0·30 = 99·39 |
| 4. " | | 23·10 | 40·86 | 24·30 | 10·25 | 0·65 | 0·53 = 99·69 |

First described by Krenner from Felsöbanya, Hungary, where it occurs with stibnite, quartz, and sphalerite, also barite and manganosiderite. Also found at the silver-tin mines of Oruro, Depart. of Oruro, Bolivia, especially the Itos mine (webnerite) with stibnite, pyrite, etc. The name *Andorite* is given for Andor von Semsey; *Sundtite*, for the mining director L. Sundt; *Webnerite*, for the mining engineer, A. Webner.

The identity of andorite, sundtite and webnerite was established by Prior and Spencer. The observed list of forms is that given by them; the position and fundamental angles are those of Brögger (sundtite). It is to be noted that the analysis of "sundtite" by Thesen, quoted by Brögger and which shows only a trace of lead (G = 5·50), it is now stated was not made upon measured crystals, hence it appears to represent another species.

**ANGLESITE**, p. 907.—Crystals described from the Altai, new form (016), Jeremejev, Vh. Min. Ges., 29, 174, 1892. Crystals from unknown source show the new form *Γ* (255), L. J. Spencer, Min. Mag., 11, 197, 1899.

Occurs at the Wellington mine, Bear Lake, West Kootanie, Br. Columbia, Hoffmann, Ref. G. Canada, 6, 27 R, 1892–93.

A mineral having the form of anglesite, associated with the boléite of Boléo, Lower California, is shown by Genth to have the composition $2PbSO_4.CaSO_4.2H_2O$, and to be a mechanical mixture of anglesite and gypsum. An origin from a possible mineral $2PbSO_4.CaSO_4$ is suggested. Am. J. Sc., 45, 32, 1893. See also Mallard, Bull. Soc. Min., 16, 195, 1893. This substance has been called *bouglisite* by Cumenge, after M. de La Bouglise (cf. Lacroix, Bull. Mus. d'Hist. Nat., 42, 1892).

**ANHYDRITE**, p. 910.—Molecular properties investigated, also of other species, Mügge, Jb. Min., 1, 71, 1898.

Refractive indices, Zimanyi, Zs. Kr. 22, 341, 1893.

Deposits of anhydrite and gypsum of Oulx described by Colomba, Att. Accad. Torino, 33, 779, 1897–98.

Formation discussed, R. Brauns, Jb. Min. **2**, 257, 1894. Occurs in bluish tabular masses in cavities in trap rock at Larrabee's quarry, Northampton, Mass. Emerson, Bull. U. S. G. Surv., **126**, 26, 1895.

**Anorthite**, p. 337.—Occurs at Buck Creek, Clay Co., N. C., analysis by C. H. Baskerville, quoted by Pratt, Am. J. Sc., **5**, 128, 1898. Occurs with epidote at Phippsburg, Me., Clarke, Am. J. Sc., **48**, 429, 1894. From Raymond, Me., anal., Melville, Bull. U. S. G. Surv., **113**, 110, 1898. See also *Feldspar.*

**Anorthoclase**, p. 324.—Analysis from acmite-trachyte of the Crazy Mts., Montana, Hillebrand, quoted by Wolff and Tarr, Bull. Mus. Comp. Zool. **16**, 227, 1893.

Brögger proposes the name *soda-microcline* (Natronmikroklin) and discusses relation to other allied feldpars, Eruptivgest. d. Kristianiagebietes, **3**, 11, 1898.

**Anthophyllite**, p. 384.—Occurs at Bakersville, N. C., in dunite; crystals analyzed by Baskerville yielded results identical with those of Penfield (anal. 1, p. 385); it is concluded that the latter's specimens came from this locality, Pratt, Am. J. Sc., **5**, 429, 1898.

*Gedrite* (14 p. c. $Al_2O_3$) occurs as a coarse, granular rock near Harris's Soapstone quarry, Warwick, Mass. Emerson, Bull. U. S. G. Surv., **126**, 86, 1895 (anal., Schneider, Eakins). On gedrite-schist from Vester Silfberg, Sweden, see Weibull, G. För. Förh., **18**, 377, 1896.

Investigation of etching-figures, R. A. Daly, Proc. Am. Acad. Sc., **34**, 424, 1899.

See also *Asbestus* and *Valléite.*

**Apatite**, pp. 762, 1027.—**Cryst.**—From the granite of Alzo, Lake Orta, Italy, G. Strüver, Riv. Min. Ital., **12**, 52, 1893. From Zöptau, Graber, Min. petr. Mitth., **14**, 269, 1894. From the emerald mines in the Ural, with (80$\bar{8}$7) Jeremejev, Vh. Min. Ges., Prot., **33**, 65, 1895. Elba, Artini, Riv. Min. Ital., **16**, 15, 1896, and Rend. Accad. Linc., **4** (2), 259, 1895. Crystals of manganapatite (5·95 p. c. MnO) from the Vestanå mines, Sweden, gave Weibull *cx* (0001 ∧ 10$\bar{1}$1) = 40° 17′ 20″. G. För. Forh., **20**, 63, 1898.

Twin crystals with tw. pl. *s* (11$\bar{2}$1), inclusions in the andesite of Mt. Stavro, Algeria, are noted by Washington, J. Geol., **3**, 25, 1895.

Discussion of vicinal faces, Karnojitsky, Vh. Min. Ges., **33**, 65, 1895.

**Comp.**—Composition discussed, Rammelsberg, Jb. Min. **2**, 38, 1897. Analyses of many specimens and discussion of variation in composition, Carnot, Bull. Soc. Min., **19**, 135, 1896; Ann. Mines, **10**, 137, 1896, (also other phosphates, *ib.*, **8**, 321, 1895,) and C. R., **122**, 1375, 1896. Montebras, analysis of blue variety, Carnot, Bull. Soc. Min., **19**, 214, 1896. Ceylon, occurring with graphite, Jannasch and Locke, Zs. anorg. Ch., **7**, 154, 1894.

**Aphthitalite**, p. 897.—Vesuvius, natural crystals seem to be in part rhombohedral, in part orthorhombic and biaxial, P. Franco, Giorn. Min., **4**, 151, 1893.

**Apophyllite**, p. 566.—**Cryst.**—Harz Mts., Luedecke, Min. d. Harzes, 572, 1896. Kimberley, S. Africa, new forms, ξ (119), χ (223), *k* (332), Currie, Trans. Edinb. G. Soc., **7**, 252, 1897.

Collo, Constantine, Algeria, crystals described and analysis, Gentil, Bull. Soc. Min., **17**, 11, 1894. No fluorine was found; Friedel also remarks on its absence while he obtains an ammoniacal reaction, *ibid.*, p. 142. A. E. Nordenskiöld found fluorine in the Collo mineral examined by him; he also shows that the presence of ammonia was early established (1805, Rose), G. För. Förh., **16**, 579, 1894.

Discussion of optical properties as influenced by heat and pressure, Klein, Jb. Min., **2**, 165, 1892 (also less complete in Ber. Ak. Berlin, 1892, p. 217).

**Anal.**—Grängesberg, Hallberg, G. För. Förh., **15**, 327, 1893. From the "blue ground" of Koppiesfontein, near Jagersfontein, So. Africa, J. A. Leo Henderson, Min. Mag., **11**, 318, 1897. From the Grand Marais, Minn., Berkey, 23 Ann. Rep. G. Surv. Minnesota, 1894, p. 195. See also above.

**Aragonite**, pp. 281, 1027.—**Cryst.**—Neussargues (Cantal), Gonnard, Bull. Soc. Min., **14**, 183, 1891; **16**, 10, 1893. Framont, new forms (572), (281), (341), (8·11·3), and others doubtful, Stöber [Mitth. G. Landes. Els.-Lothr., **4**, 113, 1894], Zs. Kr., **27**, 531. Monte Ramazzo, Liguria, Italy, new forms (430), (570), (073), (052), (331), (512), (9·2·16), (413), (3·2·12), (431), (24·25·1), (342), (7·10·3), (352), (133), (271), Negri, Riv. Min. Ital., **15**, 65, 1896. Harz Mts., (0·1·12), Luedecke, Min. d. Harzes, 338, 1896. Chaudfontaine, Belgium; G. Cesàro, Mem. Acad. Belg., **53**, 1897. From the amianthus deposits of Val Lanterna, Italy, with doubtful new forms (17·16·0), (11·13·0), (16·22·1), Brugnatelli, Riv. Min. Ital., **18**, 51, 1898, and Rend. Ist. Lombardo, **30**, 1116, 1897 (also Zs. Kr., **31**, 56, 1899).

Crystals from Sicily are referred to the monoclinic system by Viola, Zs. Kr., **28**, 225, 1897.

Determination of the heat of formation, Le Chatelier, C. R., **11**, 390, 1893,

*Tarnowitzite* in crystals from Tarnowitz described with 2·2 to 4·8 p. c. PbO, Traube, Zs. G Ges., **46**, 64, 1894.

**ARFVEDSONITE**, p. 401.—Investigation of etching-figures, also of other members of the amphibole group, R. A. Daly, Proc. Am. Acad. Sc., 34, 404, 1899.
See also *Cataphorite*.

**ARGYRODITE**, p. 150.—Shown by Penfield to be isometric and tetrahedral, not monoclinic in crystallization. The faces *m* and *o* (fig. 1, p. 150) belong to the dodecahedron, *d* (110); *f* and *k* to the tetrahedron *o* (111), and *v* to (311). Am. J. Sc., 46, 107, 1893, and 47, 451, 1894. Cf. Weisbach, Jb. Min., 1, 98, 1894. The mineral described by Penfield was from Bolivia, and was first named *canfieldite*, on the supposition that it was a new species, like argyrodite in composition, but isometric; later this name (see this Appendix, p. 13) was transferred to another sulphostannate of analogous composition also from Bolivia. Penfield shows that the formula of argyrodite is $Ag_8GeS_6$ or $4Ag_2S.GeS_2$ = Sulphur 17·1, germanium 6·4, silver 76·5 = 100. Analyses:

| | | S | Ge | Ag | Fe, Zn | Insol. |
|---|---|---|---|---|---|---|
| 1. Bolivia | G. = 6·26 | (½) 17·04 | (½) 6·55 | 76·05 | (½) 0·13 | 0·29 = 100·06 |
| 2. Freiberg | G. = 6·16 | 16·97 | (½) 6·64 | (½) 75·55 | 0·24 | Hg 0·34 = 99·74 |

A stanniferous argyrodite from Aullagas, Bolivia, described by Prior and Spencer (Min. Mag., 12, 6, 1898) occurs in regular octahedrons, in part spinel-twins; also in twinned dodecahedrons. G. = 6·19. Composition as given above, but Ge : Sn = 5 : 2. Analysis, Prior: S 16·45, Ge 4·99, Sn 3·36, Ag 74·20, Fe 0·68, Sb *tr.* = 99·68.

**ARSENIC**, p. 11.—Occurs at Akadanimura, Ohnogori, Japan, in rhombohedral crystals, Frenzel, Min. petr. Mitth., 16, 529, 1896.

**ARSENOPYRITE**, p. 97.—Weibull, after an investigation of the mineral from various Swedish localities (also Freiberg), concludes that the composition and form vary somewhat for different occurrences, but the species (when pure) has the formula Fe(As,S); well-formed crystals often enclose impurities. Zs. Kr., 20, 1, 1891. Scherer has made a still more extended investigation of the form and composition of the mineral from many localities; he finds crystals often impure, having a zonal structure, but aside from this he concludes that the composition is expressed by $m\mathrm{FeS_2} + n\mathrm{FeAs_2}$ with $m : n = 1 : 1$ nearly. No simple relation between axial ratio and composition was found. The list of forms (p. 383) contains the following not given in Min., p. 98: $\delta$ (310), $\zeta$ (0·17·2), $\epsilon$ (054). Zs. Kr., 21, 354, 1893. See also *idem. ib.*, 22, 61, 1893, analysis of crystals from Weiler in Elsass.

The composition of this and related species has been also discussed by Rammelsberg, Jb. Min., 2, 45, 1897; by Starke, Shock and Smith, J. Am. Ch. Soc., 19, 948, 1897.

*Danaite* occurs in Graham township, Algoma, Ontario (analysis by Johnston with 4 p. c. Co, 0·9 Ni), Hoffmann, Rep. G. Canada, 5, 19 R., 1889–90. Also occurs at the Evening Star mine, Trail creek, West Kootenay, Br. Columbia, *ib.*, 8, 13 R, 1895.

**ASBESTUS**, p. 386.—Investigation of various asbestiform minerals, many of which are shown to belong to fibrous anthophyllite, Merrill, Proc. U. S. Nat. Mus., 18, 281, 1895.

**Ascharite.** *W. Feit* [Ch. Ztg., 15, 327, 1891], Zs. Kr., 24, 625, 1894. Found in white lumps with boracite, in kainite and halite at Schmidtmannshall near Aschersleben. The lumps are made up of microscopic grains showing no crystallization. G. = 1·85–1·95. Nearly insoluble in water and more difficultly soluble than stassfurtite in acids. Composition of material freed from other salts by water $3Mg_2B_2O_5.2H_2O$. Analysis: ½ $B_2O_3$ 49·2, MgO 42·8, $H_2O$ 8·0 = 100.

**ASTOCHITE**, p. 1027.—The brown variety of this supposed new kind of amphibole is identical with Breithaupt's richterite (p. 391), cf. Hamberg, G. För. Förh., 13, 801, 1891; Sjögren, *ib.*, 14, 253, 1892. The latter author, however, suggests the name *natronrichterite* for the blue variety, which contains more soda and less potash than the brown. See *Richterite*.

**ASTRAKANITE**, see *Blödite*. **KALIUM-ASTRAKANITE**, see *Leonite*.

**ATACAMITE**, p. 172.—Crystals from Sierra Gorda, Chili, examined by G. F. Herbert Smith, are prismatic in habit with the pyramids *r* (111) and *n* (121) prominent; *e* (011) small; a new pyramid *h* striated ‖ edge *h*/*e* in part corresponds to (132). The axial ratio calculated from excellent measurements is $\breve{a} : \bar{b} : \dot{c} = 0·66130 : 1 : 0·75293$. Other more complex crystals, also from Atacama, show $\phi$ (131), $\rho$ (443), $\sigma$ (332) and forms with doubtful indices. Min. Mag., 12, 15, 1898.

**AUGELITE**, p. 847.—Crystallized specimens of this hitherto doubtful species examined by Prior and Spencer establish its character, Min. Mag., 11, 16, 1895.

Monoclinic with the forms *a* (100), *b* (010), *c* (001), *m* (110), *x* ($\bar{1}01$), *r* (011), *n* (112), *e* ($\bar{1}12$), and others doubtful. Axial ratio: $\hat{a} : \bar{b} : \dot{c} = 1·6419 : 1 : 1·2708$, $\beta = 67°\ 33\frac{1}{2}'$. Habit tabular ‖ *c*;

also triangular and tabular ‖ *m* or prismatic with *c* and *x* equally developed. Cleavage: *m* perfect; *x* ($\bar{1}01$) less perfect. Fracture uneven. Brittle. H. = 4·5 – 5. G. = 2·696. Luster vitreous. Colorless to white. Optically +. Ax. pl. ‖ *b*. $Bx_a \wedge \dot{b} = -34°$. $2E_{a.y} = 84° 42'$. Indices: $\alpha = 1·5736$, $\beta = 1·5759$, $\gamma = 1 5877$.

Composition: $AlPO_4.Al(OH)_3$ or $2Al_2O_3.P_2O_5.3H_2O$. Analyses, Prior:

| | $P_2O_5$ | $Al_2O_3$ | CaO | $H_2O$ |
|---|---|---|---|---|
| 1. | 34·60 | 51·40 | 0·11[a] | 13·77 = 99·88 |
| 2. | 35·33 | 50·28 | 0·90[a] | 13·93 = 100·44 |

[a] Probably foreign to the mineral.

The specimens examined were from Machacamarca, near Potosi, Bolivia, where it occurs with bournonite, octahedral pyrite, zinkenite, etc. The original mineral, described by Blomstrand, was from Westanå, Sweden; his results are here confirmed. Augelite also occurs in Bolivia at the silver mines of Tatasi and Portugalete, province of Sudchichas, dept. of Potosi (Spencer, Min-Mag., **12**, 1, 1898).

**AURICHALCITE**, p. 298.—Analysis, Torreon, Chihuahua, Mexico, Collins, Min. Mag., **10**, 15, 1892. Campiglia Maritima, also optical examination, G. D'Achiardi, Att. Soc. Tosc., Mem., **16**, 3, 1898.

**AVALITE**, p. 617.—An analysis gave Losanitsch (Ber. Ch. Ges., **28**, 2631, 1895, and Ch. News, **69**, 243, 1894) the results below (1). According to the author the so-called *milosin* of Breithaupt (1838) is derived from the alteration of avalite and is a mixture of two minerals, to one of which (2) he limits this name, the other he calls *Alexandrolite*, anal. (3).

| | $SiO_2$ | $Al_2O_3$ | $Cr_2O_3$ | $Fe_2O_3$ | MgO | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| 1. *Avalite* | 54·66 | 20·46 | 10·88 | 1·18 | 2·06 | 4·61 | 5·66 = 99·51 |
| 2. *Milosin* | 46·37 | 30·18 | 9·75 | 0·91 | *tr.* | *tr.* | 13·76 = 100·97 |
| 3. *Alexandrolite* | 52·07 | 20·76 | 13·74 | 2·22 | *tr.* | *tr.* | 10·88 = 99·67 |

Milosin is described as having a bluish-gray color; under the microscope, transparent, crystalline. Insoluble in acids. Analysis (2) made of material dried at 130°. Alexandrolite has a green color, opaque, amorphous. Soluble in hydrochloric acid. Also dried at 130°.

**AXINITE**, p. 527.—**Cryst.**—Nordmark, Sweden, new forms $\Xi$ (130), $\gamma$ ($1\bar{2}0$), *U* (061), *R* (081), *Z* ($\bar{4}41$), *Q* (327), $\lambda$ ($\bar{2}85$), Hj. Sjögren, Bull. G. Inst. Upsala, **1**, 1, 1893 and G. För. Förh., **14**, 249, 1892. Bourg d'Oisans, Dauphiné, Gonnard and Offret, Bull. Soc. Min., **16**, 75, 1893. Quenast, Belgium, Franck, Bull. Acad. Belg., **25**, 17, 1893. Harz Mts., Luedecke, Min. d. Harzes, 464, 1896.

Etching-figures investigated, T. L. Walker, Am. J. Sc., **5**, 180, 1898.

Composition discussed, Rheineck, Zs. Kr., **22**, 275, 1893. Analyses by Mauzelius of varieties from Nordmark and Dannemora and discussion of composition, Hj. Sjögren, G. För. Förh., **17**, 279, 1895. Bourg d'Oisans, analysis, Jannasch and Locke, Zs. anorg. Ch., **6**, 57, 1894.

Occurrence in the Pyrenees described, Lacroix, C. R., **115**, 739, 1892.

**AZURITE**, p. 295.—**Cryst.**—From Laurion, new forms *I* ($\bar{2}05$), *T* ($\bar{4}05$), *W* ($\bar{6}05$), Zimányi, Zs. Kr., **21**, 86, 1892. Willow's mine, Pretoria, Transvaal, new forms *Δ* (0·1·10), *Γ* ($2\bar{6}3$), *W* ($\bar{1}$·3·15). Molengraaf, Zs. Kr., **22**, 156, 1893. Mineral Point, Wis., new forms 𝔠 (307), 𝔟 ($\bar{2}03$), 𝔟 (9·12·8), Hobbs, Bull. Univ. Wisconsin, **1**, 145, 1895, and Zs. Kr., **25**, 270, 1895.

**BABINGTONITE**, pp. 381, 1027.—Occurs in minute crystals on gneiss at Buckland, Mass., Emerson, Bull. U. S. G. Surv., **126**, 32, 1895 (anal. by Schneider).

A pyroxenic mineral from the "mijakite" (augite-andesite) of the island of Mijakeshima is interpreted by Petersen as being a manganiferous babingtonite, Jb. Hamb. Wiss., **8**, 49, 53, 1890.

**Baddeckite.** *G. Chr. Hoffmann*, Rep. G. Canada, **9**, 11 R, 1896; Am. J. Sc., **6**, 274, 1898. Occurs in small isolated scales embedded in a plastic clay near Baddeck, Victoria Co., Nova Scotia. G. = 3·252. Luster pearly. Color copper-red. Streak tile-red. Analysis, R. A. A. Johnston:

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| 48·96 | 13·85 | 25·82 | 1·17 | 2·65 | 3·47 | 0·22 | 3·78 = 99·92 |

Ratio for $RO : R_2O_3 : SiO_2 : H_2O = 1 : 3 : 8 : 2$, or formula $H_4\overset{II}{R}(\overset{III}{R}_2)_3Si_8O_{24}$, the quantivalent ratio for which (3 : 4) approximates to some muscovites, to which it is referred as a ferruginous variety. B. B. fuses at 4·5 to a shiny black slag, becoming magnetic. Decomposed by strong hydrochloric acid with separation of slimy silica.

**Baddeleyite.** *L. Fletcher*, Nature, **46**, 620, 1892; Min. Mag., **10**, 148, 1893. **Brazilite,** *E. Hussak*, Jb. Min., **2**, 141, 1892; **1**, 89, 1893; Min. petr. Mitth., **14**, 395, 1895.

Monoclinic. Axes $\grave{a} : \bar{b} : \dot{c} = 0·9871 : 1 : 0·5114$; $\beta$ = *81° 14½′ = 001 ∧ 100 Hussak. 100 ∧ 110 = *44° 17½′, 001 ∧ $\bar{1}$01 = *29° 4½′, 001 ∧ 011 = 26° 48½′. Observed forms: *a* (100), *b* (010), *c* (001); *m* (110), *l* (230), *k* (120), *s* (203), *t* (101), *x* (201) as tw. pl., *r* ($\bar{1}$01), *α* ($\bar{2}$01); *d* (021); *p* (221); *n* ($\bar{1}$11). Angles: *mm‴* = 88° 35′, *a′r* = 69° 41′, *dd′* = 90° 37′, *cm* = 83° 44½′.

Crystals usually twins: (1) *a* (100) most common, also as polysynthetic twinning lamellæ; (2) *m* (110) both contact- and penetration-twins, also as thin lamellæ; (3) *x* (201) rather rare. Habit tabular ‖ *a*. Cleavage: *c* rather perfect; *b* much less so; also parting ‖ *m*. H. = 6·5. G. = 5·5 Hussak; 6·025 Fletcher. Luster greasy to vitreous, on opaque crystal nearly submetallic resembling columbite. Color variable, from colorless to yellow, brown and finally black and opaque. Streak white to browish white. Pleochroic. Optically —. Ax. pl. ‖ *b*. $Bx_a$ inclined to $\dot{c}$ about + 13° Fletcher. Dispersion inclined. Ax. angle large, 2E = 70°–75°.

Composition, zircon dioxide, $ZrO_2$. Analysis, C. W. Blomstrand, quoted by Hussak, Jb. Min., **1**, 89, 1893:

| $ZrO_2$ | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO. | Alk. | ign. |
|---|---|---|---|---|---|---|---|
| 96·52 | 0·70 | 0·43 | 0·41 | 0·55 | 0·10 | 0·42 | 0·89 = 99·52 |

Of the accessory constituents above given, only the iron belongs to the mineral itself; the variation in color is probably due to variation in amount of iron.

B. B. nearly infusible, glows brightly; reacts faintly for iron with borax. When cooled suddenly and pressed flat in the borax bead microlites and microscopic crystals are formed. Insoluble in acids; only slightly attacked by concentrated sulphuric acid if in fine powder. Decomposed by fusion with acid potassium sulphate.

First identified by Fletcher, and described both as regards form and composition, on a single fragment of a crystal (8 grams) from the gem sands of Rakwana, Ceylon; geikielite was obtained from the same source. About the same time discovered by Hussak from Brazil and named *brazilite*, but the composition was only later correctly determined by the analysis of Blomstrand. The Brazilian mineral occurs as an accessory constituent of a decomposed magnetite-pyroxenite (jacupirangite of Derby) of the magnetite deposits of Jacupiranga, on the branch of the same name of the Rio Ribeira, State of São Paulo. It is associated with magnetite, apatite, perovskite, ilmenite, titanite, microlite, zircon, etc. Also identified as an accessory constituent of a rock resembling jacupirangite from the nephelite-syenite region of Alnö, Sweden, cf. Hussak, Jb. Min., **2**, 228, 1898.

Named after Mr. Joseph Baddeley, who brought the specimen from Rakwana.

BAGOTITE. — Green pebbles, identified as lintonite from Bagot, Ontario. See Egleston, Cat. Min., 192, 1889 (1887); Chester, Dict. Names Min., 25, 1896; Spencer, Min. Mag., **11**, 328, 1897.

BARITE, pp. 899, 1027.—**Cryst.**—Lunkány, Hungary, Zimanyi, Földt. Közl., **22**, 267, 1892. Montevecchio, Sardinia, new forms (1·0·25), (403)?; (123), (157), (2·5·11), (163)?. Negri, Riv. Min. Ital., **12**, 3, 1893. Bergheim, Ober-Elsass, Feurer, Mitth. G. Land. Els.-Loth., **4**, 89, 1893; Zs. Kr., **25**, 623. Caucasus, new form *I* (355), Zimanyi, Földt. Közl., **24**, 404, 1894. From Harz Mts., Luedecke, Min. d. Harzes, 357, 1896. Dobsina, new form 𝔭 (77:), Melczer, Földt. Közlöny, **26**, 357, 1896, Zs. Kr., **30**, 183. Vassera, Lombardy, Italy, Artini, Riv. Min. Ital., **16**, 10, 1896. Odenwald, occurrence described, also complex crystals, new form 𝔦 (196), Kraatz-Koschlau, Abh. Hess. G. Land., **3**, No. 2, 55, 1897. From various localities in Belgium, Cesàro, Mem. Acad. Belg., **53**, 1897. Körösmezö, Hungary, G. Moesz, Földt. Közl., **27**, 495, 1897.

Apparent hemimorphism discussed, Beckenkamp, Zs. Kr., **27**, 583, 1896. See also *idem, ibid.*, **30**, 55, 1898.

As cementing material in sandstone, F. Clowes, Proc. Roy. Soc., **64**, 374, 1899 (Min., p. 908).

BARIUM ANORTHITE.—See *Celsian.*

BARIUM HEULANDITE.—See *Heulandite.*

BARKEVIKITE, p. 405.—Daly's investigation of etching-figures shows it to be more closely related to common hornblende than to arfvedsonite. Proc. Amer. Acad. Sc., **34**, 374, 1899.

A related amphibole occurs in the sodalite-syenite of Montana (*c* ∧ $\dot{c}$ = 18°), Lindgren and Melville, Am. J. Sc., **45**, 292, 1893.

See also *Cataphorite.*

**Barracanite.** *R. Schneider*, J. pr. Ch., **52**, 555, 1895.—See *Cubanite.*

BARYTOCALCITE, p. 289.—In parallel cryst. growth with barite, Mügge, Jb. Min., **1**, 252, 1895. Optical examination ($\beta$ = 1·684) and relation to bromlite, also to calcite, aragonite and witherite, Mallard, Bull. Soc. Min., **18**, 10, 1895.

**Barytocelestite.**—See *Celestite.*

**Basiliite.** *Igelström*, G. För. Förh., **14**, 307, 1892; Zs. Kr., **22**, 470, 1893.
In foliated forms. Luster metallic or submetallic. Color steel-blue, but in very thin splinters blood-red. Not magnetic. Several partial analyses yielded:

$Sb_2O_5$ 13·09 $Mn_2O_3$ 70·01 $Fe_2O_3$ 1·91 $H_2O$ 15·00

Calculated formula, $11(Mn_2O_3,Fe_2O_3).Sb_2O_5.21H_2.O$. Dissolves readily in warm hydrochloric acid with evolution of chlorine. Yields water in the closed tube and turns black and finally red-brown. Occurs with hausmannite and calcite at the Sjö mine, Örebro, Sweden. Named after the alchemist, Basilius Valentinus.

**Bastnäsite**, p. 291.—Colorado, analysis, Hillebrand, Am. J. Sc., **7**, 51, 1899.

**Batavite.** *E. Weinschenk*, Zs. Kr., **28**, 160, 1897. A decomposition-product from the graphite district of Passau, Bavaria. Occurs in aggregates of pearly micaceous scales, hexagonal in outline. G. = 2·183. Approximate composition, $4H_2O.4MgO.Al_2O_3.4SiO_2$. Analysis:

§ $SiO_2$ 42·33 $Al_2O_3$ 16·35 MgO 28·17 $H_2O$ 13·19 = 100·04

Named from *Castra Batava*, Roman name for Passau.

**Bauxite**, p. 251.—Description of deposits in Arkansas, Branner, Amer. Geol., **7**, 181, 1891, J. Geol., **5**, 263, 1897; in Georgia, Alabama, etc., C. Willard Hayes, 16 Ann. Rept., U. S. G. Surv., Pt. III, pp. 547–597, 1896; also McCalley, Proc. Ala. Ind. Sc. Soc., **2**, 21, 1892; Laur, Trans. Am. Inst. Mng. Eng., **24**, 234, 1894. Analyses, from Calhoun Co., Alabama, Hillebrand, Bull. U. S. G. Surv., **113**, 109, 1893.

A general investigation (with analyses) of material from the Vogelsberg has led Liebrich to the conclusion that bauxite is an alteration-product of a basaltic rock. It is in part amorphous, in part crystalline and having the composition of the aluminium hydrate gibbsite, crystals of which occur in cavities in the mass Ber. Oberhess. Ges., **28**, 57, 1892 (abstr. in Zs. Kr., **23**, 296, 1894); also Zs. prakt. Geol., **5**, 212, 1897. On the relation of bauxite to laterite, see Bauer, Jb. Min., **2**, 208, 1898.

Contains a supposed new element, R. S. Bayer, Ch. News, **71**, 128, 1895.

**Beaconite.**—See *Talc.*

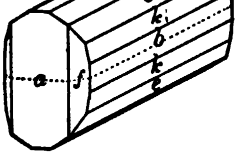
**Bentonite.**—Eng. Mng. J., Oct. 22 and Nov. 26, 1898. A Wyoming clay used in making candy, in adulterating candy, etc.

**Beresowite.** Beresovit. Berezovite. *J. Samoilow*, Bull. Soc. Moscou, 290, 1897.
A chromate and carbonate of lead from Berezov in the Ural, associated with galena and cerussite; occurs also altered to crocoite. Crystalline in small lamellæ with one perfect cleavage. G. = 6·69. Color deep red. Birefringent. Composition $6PbO.3CrO_3.CO_2$. Analysis: $CrO_3$ § 17·93, PbO § 79·30, $CO_2$ 2·46.

**Berthierite**, p. 114.—This or a related mineral occurs on Mt. Gibbs, Tuolumne Co., California, Turner, Am. J. Sc., **5**, 428, 1898.
From Příbram, anal., Hofmann, Ber. Ak. Böhm., Oct. 15, 1897.

**Bertrandite**, pp. 545, 1028.—Occurs with hamlinite in Oxford Co., Me., in twin crystals, prismatic ∥ ă (Fig. 1, *k* = 0·12·1); G. = 2·571. Penfield, Am. J. Sc., **4**, 316, 1897. Crystals, in part twins, are described from Pisek and other localities, by Vrba. Zs. Kr., **24**, 112, 1894.

1.



Bertrandite.

**Beryl**, pp. 405, 1028.—Cryst.—Mursinka, crystals of rhombohedral habit as regards the *s*-faces $(11\bar{2}1)$; etching-prominences show the forms $(43\bar{7}4)$, $(54\bar{9}5)$ $(6\cdot5\cdot\overline{11}\cdot5)$, $(54\bar{9}4)$, $(43\bar{7}3)$, Arzruni, Vh. Min. Ges., 31, 155, 1894. Mursinka, with $(13\cdot1\cdot\overline{14}\cdot0)$ and $(19\cdot1\cdot\overline{20}\cdot1)$, Jeremejev, *ibid.*, 29, 230, 1892; also Ilmen Mts. $(11\bar{2}6)$, Mursinka $(22\bar{4}3)$, Nerchinsk $(40\bar{4}5)$, *idem.*, *ibid.*, Prot., 33, 26, 1895. Pisek, with λ $(15\cdot1\cdot\overline{16}\cdot1)$, also supposed twins, with $(5\cdot5\cdot\overline{10}\cdot8)$ as twinning plane; further, corrosion forms *e* $(60\bar{6}5)$, *r* $(30\bar{3}2)$, *u* $(20\bar{2}1)$, ξ $(11\bar{2}4)$, *o* $(11\bar{2}2)$ and others, Vrba, Zs. Kr., **24**, 104, 1894. On a crystal from New York Island, Ries, Trans. N. Y. Acad. Sc., **16**, 329, 1897. Etching-figures investigated, Traube, Jb. Min., Beil.-Bd., **10**, 464, 1896.

On optical characters as influenced by heat and pressure, Pockels, Jb. Min., Beil.-Bd., **8**, 217, 1893.

A variety from German So. West Africa showed distinct asterism, also cat's-eye effect, Stapff, Zs. prakt. G., 1, 244, 1893.

Analysis of emerald from Chanteloube, Haute-Vienne, Lebeau, C. R., **121**, 601, 1895.

Occurrence of emerald on Big Crab-Tree Mt., near Bakersville, Mitchell Co., N. C., Kunz, Am. J. Sc., **48**, 429, 1894.

On synthesis, Traube, Jb. Min., **1**, 275, 1894.

BERZELIITE, p. 753.—A *soda-berzeliite* from Långban, Sweden, has been described by Hj. Sjögren (Bull. G. Inst. Upsala, **2**, 92, 1895). Usually massive, also in isometric crystals (110, 211). No cleavage. H. = 4 – 4·5. G. = 4·21. Luster greasy. Color fire-red or orange-yellew. Isotropic. Composition near caryinite (wh. see), but contains soda and differs in crystallization. Analysis, R. Mauzelius:

| $As_2O_5$ | $Sb_2O_5$ | $V_2O_5$ | MnO | CaO | FeO | MgO | $Na_2O$ | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 52·90 | *tr.* | 0·24 | 21·41 | 18·34 | 0·38 | 0·72 | 5·05 | 0·09 | 0·40 = 99·53 |

Sjögren notes the similarity of the above berzeliite to pyrrharsenite (Min., p. 753), and Igelström, giving another analysis of the latter, calls it *mangan-berzeliite*, Zs. Kr., **23**, 592, 1894.

An incomplete analysis of berzeliite is given by Church, Min. Mag., **11**, 10, 1895.

BEYRICHITE, p. 76.—Crystals from Altenkirchen have been investigated by Laspeyres, who finds it in form and composition ((Ni,Co,Fe)S) like millerite, but the sp. gravity = 4·699 (G. = 5·3 –5·9 for millerite); he regards all millerite as formed by paramorphism from beyrichite. Crystals, in part twins, are described with the forms: *m* ($10\bar{1}0$), *a* ($11\bar{2}0$), *i* ($41\bar{5}0$), *r* ($10\bar{1}1$), *e* ($10\bar{1}2$). Axis $\dot{c}$ = 0·3277. Zs. Kr., **20**, 535, 1892; also Vh. Ver. Bonn, **50**, 157, 1893.

BINNITE, p. 118.—Tetrahedral crystals are described by Baumhauer, Zs. Kr., **21**, 202, 1892. Same conclusion reached by Trechmann, who adds many new forms, in part doubtful, Min. Mag., **10**, 220, 1893. Later Baumhauer adds further new forms, Zs. Kr., **28**, 545, 1897.

Announced by Prior and Spencer to be identical with *tennantite*, Min. Soc. Gt. Britain, Jan. 31, in Nature, **54**, 454, 1899.

BIOTITE, p. 627.—Twin crystals (Servian twins) from Dschepa, Servia, formed of two interpenetrating crystals which have the base parallel while one is turned 30° with reference to the other, Uroschewitsch, Zs. Kr., **29**, 278, 1897.

Composition (anal.) of some rock-forming varieties from California, Turner, Am. J. Sc., **7**, 294, 1899.

Discussion of conditions of alteration in a magma (also of amphibole), Washington, J. Geol., **4**, 257, 1896.

On the alteration-products of magnesia mica and the relation between composition and optic axial angle, Z. Schimmer, Inaug. Diss., Jena, 1898, pp. 1–70, and Jenaisch. Zeitschr., **32**, 351, 1898.

See also *Mica*.

**Birmite.**—See *Burmite*.

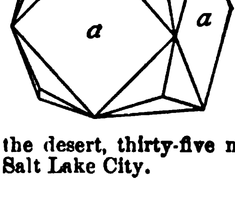
BISMUTHINITE, pp. 38, 1028.—Occurs in Jonquière township, Chicoutimi Co., Quebec (analysis by Johnston), Hoffmann, Rep. G. Canada, **6**, 19 R, 1892–93. Also Lyndoch, Renfrew Co., Ontario, *ib.*, **8**, 14 R, 1895. From Sinaloa, Mexico, analysis, Melville, Bull. U. S. G. Surv., **90**, 40, 1892.

BISMUTITE, p. 307.—From Mt. Antero, Chaffee Co., Colorado, analysis of an impure variety, Genth, Am. J. Sc., **43**, 188, 1892.

**Bismutosmaltite.** *A. Frenzel*, Min. petr. Mitth., **16**, 524, 1896.—See *Skutterudite*.

**Bixbyite.** *S. L. Penfield* and *H. W. Foote*, Am. J. Sc., **4**, 105, 1897.

Isometric; in cubes with *n* (211). Cleavage: octahedral in traces. Brittle. H. = 6 – 6·5. G. = 4·945. Luster metallic, brilliant. Color and streak black. Opaque.



Composition, essentially $FeO.MnO_2$, or analogous to perovskite. The analysis may also be interpreted as $R_2O_3$, where R = Fe and Mn in nearly the ratio of 1 : 1. The $SiO_2$ and $Al_2O_3$ of the analysis are due to impurities. Analysis:

| | $TiO_2$ | $Fe_2O_3$ | MnO | MgO | O | $SiO_2$ | $Al_2O_3$ |
|---|---|---|---|---|---|---|---|
| ‡ | 1·70 | 47·98 | 42·05 | 0·10 | 4·38 | 1·21 | 2·53 = 99·95 |

Fuses B.B. at 4 and becomes magnetic. In very fine powder is dissolved with some difficulty in hydrochloric acid, evolving chlorine.

Occurs with topaz and decomposed garnet in rhyolite on the edge of the desert, thirty-five miles southwest of Simpson, Utah. Named after Mr. Maynard Bixby of Salt Lake City.

BLIABERGSITE.—*L. J. Igelström*, G. För. Förh., **18**, 41, 1896; Zs. Kr., **27**, 603. *M. Weibull*, *ibid.*, **18**, 515, 1896.—See *Ottrelite*.

BLÖDITE, p. 946.—Crystals with *r* (450) described and measured, from the salt seas of the Astrakan Govt., Jeremejev, Zs. Kr., **23**, 268, 1894, and Vh. Min. Ges., **28**, 430, 1891. Punjab Salt Range, crystals described with analysis, F. R. Mallet, Min. Mag., **11**, 311, 1897.
A related potash compound ($K_2Mg(SO_4)_2 + 4H_2O$), called *Kaliastrakanite* or *Kalium-astrachanite*, has been named *Leonite* (wh. see).

**Blueite.** *S. H. Emmens*, J. Am. Chem. Soc., **14**, No. 7, 1892.—See *Pyrite*.

BOLÉITE, p. 1028.—The complex relations of percylite, boléite, pseudoboléite, cumengéite are discussed under *Percylite*.

BORACITE, p. 879.—Etching-figures described, Baumhauer, Die Resultate d. Aetzmethode, etc., 1894.
Specific heat as influenced by the temperature, Kroeker, Jb. Min., **2**, 125, 1892.
Occurrence at Westeregeln, Bücking, Ber. Ak. Berlin, 539, 1895.
Formation of isomorphous chloroborates, Rousseau and Allaire, C. R., **116**, 1195, 1893.

BORNITE, p. 77.—Crystals from Virgen, near Prägratten, Tyrol, described with (533) and (322)?, Heimerl, Bull. Soc. Min., **17**, 289, 1897. See also Klein, Ber. Ak. Berlin, 385, 1898, who describes a crystal from the Frossnitz glacier, Tyrol, with (322) and (211), symmetry tetrahedral.
Occurs as a copper ore in western Idaho, Packard, Am. J. Sc., **50**, 298, 1895.

**Bouglisite.** *E. Cumenge* (*Lacroix*, Bull. Mus. d'Hist. Nat. Paris, 42, 1895).—See *Anglesite*.

BOULANGERITE, p. 129.—Described by Hj. Sjögren (G. För. Förh., **19**, 153, 1897), from the mines of Sala, Sweden. In orthorhombic crystals, prismatic or tabular ‖ *a* (100). Axes $\breve{a} : \bar{b} : \dot{c} = 0{\cdot}5527 : 1 : 0{\cdot}7478$. Forms: *a* (100), *b* (010); *r* (210), *q* (320), *m* (110), *n* (120), *μ* (140), *l* (160), *k* (180), *i* (1·10·0), *h* (1·14·0); *u* (012). Angles: $mm''' = 57° 52'$, $b\mu = {}^*24° 20'$, $bu = {}^*69° 30'$. The form approximates to that of diaphorite. Composition: $Pb_5Sb_4S_{11}$ or $5PbS.2Sb_2S_3$. Analysis, R. Mauzelius:

| | S | Sb | Pb | Zn | Ag | |
|---|---|---|---|---|---|---|
| G. = 6·185 | 18·91 | 25·54 | 55·22 | 0·06 | *tr.* | insol. 0·23 = 99·96 |

The author concludes that boulangerite has the composition $5PbS.2Sb_2S_3$ like diaphorite, to which it also approximates in form. Further he shows that the earlier analyses do not correspond to $3PbS.Sb_2S_3$, the formula usually accepted. The minerals plumbostib and embrithrite ($10PbS.3Sb_2S_3$ Frenzel) do not belong to boulangerite, but he regards them as independent species.

BOURNONITE, p. 126.—**Cryst.**—Nagybánya, complex crystals described with the new forms, *C* (503), $\zeta$ (021), Schmidt, Zs. Kr., **20**, 151, 1892. Harz Mts., Luedecke, Min. d. Harzes, 150, 1896. Peychagnard, Isère, France, new forms (950), (780)?, (380), (034), (032), (11·3·4), (568), Termier, Bull. Soc. Min., **20**, 101, 1897. Pontgibaud, Puy-de-Dôme, supposed new forms (18·5·0), (5·7·12), (50·66·59), (918). Gonnard, Bull. Soc. Min., **20**, 312, 1897.
Measurements of crystals from different localities show irregularities in angle, but fail to establish monoclinic symmetry, F. B. Peck, Zs. Kr., **27**, 299, 1896. Measurements of heat conductivity, *idem*, *ibid.*, p. 319.
Occurs massive in Bagot township, Renfrew Co., Ontario, Hoffmann, Rep. G. Canada, **7**, 13 R, 1894. Also at the mine Pulacayo, Huanchaca, Bolivia, Penfield and Frenzel, Zs. Kr., **28**, 608, 1897.

BRAUNITE, pp. 232, 1029.—Saint Marcel, analyses, Gorgeu, Bull. Soc. Chim., **9**, 656, 1893.

**Brazilite.** *E. Hussak*, Jb. Min., **2**, 141, 1892; **1**, 89, 1893.—See *Baddeleyite*.

BREISLAKITE, p. 391.—Referred by Wichmann to fayalite, Zs. Kr., **28**, 529, 1897.

BREITHAUPTITE, pp. 72, 1029.—Crystals from Andreasberg show the forms *c*, *m*, *w* ($30\bar{3}1$) and ($70\bar{7}1$); axis $\dot{c} = 0{\cdot}8627$. Busz, Jb. Min., **1**, 119, 1895; also *idem*, quoted by Laspeyres, Zs. Kr., **24**, 496, 1895.
Analysis (by Fasolo) of *arite* from Nieddoris, Sardinia, quoted by Brugnatelli, Rend. Accad. Linc., **3** (1), 86, 1894: As 29·82, Sb 26·57, Bi 0·99, Ni 36·81, Co 3·91, Fe 0·98, S 0·85, Zn *undet.* = 99·93. Analyses are also given of an impure breithauptite; of a mineral near gersdorffite (Sb 8·11 p. c.) corresponding to $(Ni,Fe,Co)_2(S,As,Sb)_3$; also of smaltite.

BREWSTERITE, p. 576.—Occurs in the Harz, Luedecke, Min. d. Harzes, 587, 1896.

**Bröggerite**, p. 889.—See *Uraninite.*

**Bromlite**, p. 283.—Optical examination and relation to barytocalcite, etc., Mallard, Bull. Soc. Min., **18**, 7, 1895.

**Brongniardite**, p. 123.—The supposed isometric crystals are shown to belong to the species argyrodite or canfieldite, Prior and Spencer, Min. Mag., **12**, 11, 1898. It is further suggested by Spencer that brongniardite and diaphorite may be identical, Am. J. Sc., **6**, 316, 1898.

**Brookite**, pp. 248, 1029.—Crystals from Brazil show the new forms *g* (305), *ν* (124), ξ (146), Hussak, Min. petr. Mitth., **12**, 460, 1892. On secondary twin formation, Hussak, Jb. Min., **2**, 99, 1898.

Occurs with octahedrite on quartz at Placerville, Eldorado Co., California, Kunz, Am. J. Sc., **43**, 329, 1892.

**Brucite**, p. 252.—Analysis of *nemalite* from Afghánistán, Mallet, Min. Mag., **11**, 211, 1897, Rec. G. Surv. India, **30**, 233, 1898.

Nemalite absorbs electric waves vibrating in a certain plane and transmits those vibrating normal to it; so also tourmaline (with planes reversed), but not to so great a degree. J. C. Bose, Nature, **57**, 353, 1898.

**Brushite**, p. 828.—A calcium phosphate found in human skeletons (1630) unearthed at Paris in 1896 (Lacroix, Bull. Soc. Min., **20**, 112, 1897), has the optical characters of pharmacolite, viz.: optically —; ax. plane and $Bx_o \perp b$; $Bx_a$ inclined 25° forward to trace of *c*; $2V_a = 81°$. It might hence be inferred to belong to brushite; however, G. = 2·31 and the amount of water was too small (loss on ignition = 25·5 p. c.; this is probably too high). For metabrushite from Sombréro, G. = 2·30 was obtained, from the Île des Oiseaux 2·33.

**Burmite.** Birmite. *Otto Helm*, Rec. G. Surv. India, **25**, 180, 1892; **26**, 61, 1893. Schrift. Ges. Danzig, 8, Nos. 3–4, p. 63, 1893. *Fritz Noetling*, Rec. G. Surv. India, **26**, 31, 1893. A fossil resin, resembling amber, but harder and tougher. Occurs abundantly in Upper Burma. An analysis gave Helm: C 80·05, H 11·50, O 8·43, S 0·02 = 100.

**Cacoxenite**, p. 848.—Partial optical examination, Luquer, Am. J. Sc., **44**, 154, 1893.

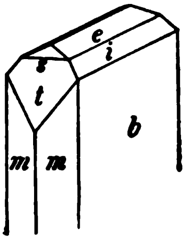
Analysis by Church from Hrbek, near St. Benigna, Bohemia (Min. Mag., **11**, 8, 1895), gave: $P_2O_5$ 19·76, $Fe_2O_3$ 48·57, $H_2O$ (ign.) 18·11 (F *tr.*), $H_2O$ (vacuo) 18·69 = 100·13. This corresponds to the complex relation $9Fe_2O_3.4P_2O_5.51H_2O$.

**Calamine**, p. 546.—**Cryst.**—Radzionkau, Silesia, Traube, also anal. (Breitfeld) showing presence of 2·17 p. c. PbO, Zs. G. Ges., **46**, 65, 1894. Sterling Hill, N. J., and Clear Creek Co., Colorado (Figs. 1, 2), Pratt, Am. J. Sc., **48**, 213, 1894. Gorno, Val Seriana, Italy, new form (503), Artini, Riv. Min. Ital., **16**, 19, 1896. Moresnet, new form (811), Buttgenbach, Ann. Soc. G. Belg., **24**, xl, 1897. Nebida, Sardinia, C. Riva, Rend. Accad. Linc., **6** (1), 421, 1897.

Analysis of pure variety from Wythe Co., Va., Jones, Am. Ch. J., **14**, 621, 1892.

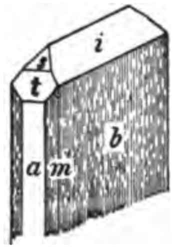
Occurs in West Kootanie district, Br. Columbia, Hoffmann, Rep. G. Canada, **6**, 28 R, 1893. Also finely crystallized at the Elkhorn mines, Jefferson Co., Montana.

1.



New Jersey.

2.



Colorado.

**Calaverite**, p. 105.—Hillebrand refers here gold tellurides from Cripple Creek, Colorado (Am. J. Sc., **50**, 128, 426, 1895). A crystallized specimen from the Prince Albert mine, which (according to Penfield) seemed to be triclinic, but approximating toward sylvanite in angle, though without its cleavage, gave the results of anal. 1*a* (1*b* deducting impurities). Color pale bronze-yellow. H. = 3. G. (corrected) = 9·00. Two other less pure samples from different mines gave anals. 2, 3 deducting impurities; all correspond to $AuTe_2$. Krennerite also occurs at Cripple Creek, and according to Pearce sylvanite. See Geol. Cripple Creek Dist., Colorado, by Whitman Cross and R. A. F. Penrose, Jr., 16 Ann. Rept. U. S. G. Surv., Part II.

| | Te | Au | Ag | |
|---|---|---|---|---|
| 1*a*. | 57·27 | 38·95 | 3·21 | insol. 0·33, $Fe_2O_3$ 0·12 = 99·88 |
| 1*b*. | 57·60 | 39·17 | 3·23 | = 100 |
| 2. | 57·40 | 40·83 | 1·77 | = 100 |
| 3. | 57·30 | 41·80 | 0·90 | = 100 |

See also *Goldschmidtite*, *Kalgoorlite* and *Krennerite.*

**Calcistrontite.** *Von der Marck*, Vh. Ver. Rheinl. Corrbl., **39**, 84, 1882. A mineral substance from near Hamm, Westphalia, supposed to have the composition $8CaCO_3.SrCO_3$. It is shown by Laspeyres and Kaiser to be a mechanical mixture of calcite and strontianite, Zs. Kr., **27**, 41, 1896.

CALCITE, pp. 262, 1026.—**Cryst.**—Landelies, Belgium, Renault, Ann. Soc. G. Belg., **20**, 75, 1892. Nieder-Rabenstein, crystals perhaps to be referred to the dolomite (phenacite) type, Beckenkamp, Zs. Kr., **20**, 163, 1892; cf. also Gaubert, Bul . Mus. d'Hist. Nat., p. 39, 1897. Feldkirch, Gissinger, Zs. Kr., **22**, 359, 1893. Visby, Gotland, crystals of pyramidal habit, Hamberg, G. För. Förh., **16**, 709, 1894. Freiberg, Sansoni, Giorn. Min., **5**, 72, 1894, and Zs. Kr., **23**, 451, 1894. Crystals from the Galena limestone, Wisconsin, Hobbs, Bull. Univ. Wisconsin, **1**, 115, 1895, and Zs. Kr., **25**, 257, 1895. Lake Superior, Palache, Zs. Kr., **24**, 588, 1895. Framont *et al.* in Elsass-Lothringen, Stöber, Zs. Kr., **24**, 629, 1895. Körösmező, G. Moesz, Földt. Közl., **27**, 495, 1898. Couzon, Rhône, Gonnard, C. R., **122**, 348, 1896, and Bull. Soc. Min., **20**, 18, 330, 1897. Nordmark, Sweden, K. Winge, G. För. Förh., **18**, 527, 1896. Harz Mts., Luedecke, Min. d. Harzes, 285, 1896. Budapest, Melczer, Földt. Közlöny, **26**, 79, 1896; **28**, 257, 1898. From various localities in Belgium, Cesàro, Mem. Acad. Belg., **53**, 1897. From the diabase of Neumark, Schnorr (1896), ref. in Zs. Kr., **30**, 660. Auerbach, Hesse, A. Leuze (1896), ref. in Zs. Kr., **30**, 662. Montecatini, G. D'Achiardi, Att. Soc. Tosc., Proc. Verb., May 9, 1897. Jarow near Wran, Bohemia, Polak, Lotos, **17**, 169, 1897.

Selective absorption investigated, Nichols and Snow, Phil. Mag., **33**, 379, 1892.

Refractive indices of Iceland Spar, Dufet, Bull. Soc. Min., **17**, 149, 1894.

Dichroism for infra-red waves, E. Merritt, Wied. Ann., **55**, 49, 1895.

Investigation on the influence of substances in solution upon the crystallization, etc., Vater, Zs. Kr., **21**, 433; **22**, 209, 1893; **24**, 366, 378, 1895; **27**, 477, 1896; **30**, 295, 373, 485, 1898.

Formation of stalactites in caves, G. P. Merrill, Proc. U. S. Nat. Mus., **17**, 77, 1894.

Discussion of origin, composition and uses of *onyx marble* from many localities; with one exception these belong to calcite, *idem*, Rep. U. S. Nat. Mus., **16**, 539, 1893.

Investigation of *hislopite* (Min., p. 266) showing great variation in the amount of glauconite, while other inclusions also occur, Holland, Rec. G. Surv. India, **26**, 166, 1893.

CALEDONITE, p. 924.—Crystals described with $\tau$ (113), $\kappa$ (023) as new forms, Busz, Jb. Min., **1**, 111, 1895.

CALOMEL, p. 153.—Optical characters determined, confirming results of Senarmont (Min., p. 154), who showed its very high birefringence; Dufet obtained (Bull. Soc. Min., **21**, 90, 1898):

| | $\omega$ | $\epsilon$ | $\epsilon - \omega$ |
|---|---|---|---|
| Li | 1·95560 | 2·6006 | 0·6450 |
| Na | 1·97325 | 2·6559 | 0·6827 |
| Tl | 1·99085 | 2·7129 | 0·7220 |

**Canfieldite.** *S. L. Penfield*, Am. J. Sc., **47**, 451, 1894 (not canfieldite, same author, *ib.*, **46**, 107, 1893, = argyrodite).

Isometric, perhaps tetrahedral. In octahedrons *o* (111) with *d* (110). Fracture uneven to small conchoidal. Brittle. H. = 2·5–3. G. = 6·276. Luster metallic, brilliant. Color black with bluish tint.

Composition, $Ag_8(Sn.Ge)S_6$; essentially $Ag_8SnS_6$ or $4Ag_2S.SnS_2$, but with the tin in part replaced by germanium, ratio Sn, Ge = 12 : 5. Analysis:

| S | Sn | Ge | Ag | Fe,Zn |
|---|---|---|---|---|
| 16·22 | 6·94 | 1·82 | 74·10 | 0·21 = 99·29 |

As noted on p. 6, Penfield has shown that argyrodite has the corresponding composition $Ag_8GeS_6$. Franckeite (wh. see) is another new sulpho-stannate.

B. B. fuses at 2 on charcoal, yielding a coating of the mixed oxides of tin and germanium, white or grayish near the assay, tinged with yellow on the edges. By long blowing a globule of silver covered by tin oxide is obtained. In the closed tube sulphur is given off, and at a high temperature a slight deposit of germanium sulphide.

Occurs intimately associated with native silver at La Paz, Bolivia. Named after F. A. Canfield, of Dover, N. J.

CARNALLITE, p. 177.—Discussion of conditions of formation and of alteration, Van't Hoff and Meyerhoffer, Ber. Ak. Berlin, 488, 1897; also later papers by Van't Hoff and others, 1897 and 1898.

**Carnotite.** *C. Friedel* and *E. Cumenge*, C. R., **128**, 532, 1899, and Bull. Soc. Min., **22**, 26, 1899.

Occurs as a yellow crystalline powder, or in loosely cohering masses, easily separated by the fingers; intimately mixed with a quartzose sand.

Composition, perhaps $K_2O.2U_2O_3.V_2O_5.3H_2O$. Analyses, after the separation of silica, of air-dried material:

| $V_2O_5$ | $U_2O_3$ | $K_2O$ | $H_2O$ |
|---|---|---|---|
| 20·12 | 63·54 | 10·37 | 5·95 = 99·98 |
| 20·31 | 64·70 | 10·97 | 5·19 $Fe_2O_3$ 0·96 = 102·13 |
| 19·95 | 62·46 | 11·15 | — $Fe_2O_3$ 06·5 |

The radiant power has been investigated by M. and Mde. P. Curie.

Occurs in Montrose Co., Colorado, in cavities or associated with malachite and azurite. Some samples show 60 p. c. of $SiO_2$, the purest 2·6 to 7·2 p. c. Separation is accomplished by nitric acid. Named after M. Adolphe Carnot.

CARYINITE, p. 754.—Further described by Hj. Sjögren. Occurs at Långban, massive, filling fissures in a coarse mixture of schefferite, rhodonite and hedyphane. Anisotropic, without pleochroism. Two cleavages noted parallel to *m* (110) and *b* (010), *bm* = 49° 15′. Extinction-observations on plates ∥ and ⊥ to *b* make the system orthorhombic. Optically +. $Bx_a \perp b$. Ax. pl. ∥ *a* (100). An analysis by R. Mauzelius gave:

| | $As_2O_5$ | $P_2O_5$ | $V_2O_5$ | PbO | MnO | FeO | CaO | MgO | BaO | $Na_2O$ | $K_2O$ | $H_2O$ | Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G. = 4·29 | 49·78 | 0·19 | *tr.* | 9·21 | 18·66 | 0·54 | 12·12 | 3·09 | 1·03 | 5·16 | 0·37 | 0·53 | *tr.* = 100·68 |

This leads to the formula $10RO.3A_2O_5$ or, if the presence of the radical (OH) is assumed, to $R_3As_2O_8$. Nearly the same composition is obtained for the soda-berzeliite (see p. 10). The origin of berzeliite by the alteration of caryinite is confirmed. Bull. G. Inst. Upsala, **2**, 87, 1895.

CASSITERITE, pp. 234, 1030, 1037.—Crystals described with new forms λ (10·9·0), *f* (835). Kohlmann, Zs. Kr., **24**, 350, 1895. On artificial crystals, A. Arzruni, Zs. Kr., **25**, 467, 1895.

Description of occurrence of tin ores in Bolivia, A. W. Stelzner, Zs. G. Ges., **49**, 51, 1897. On the tin deposits of Temescal, So. California, Fairbanks, Am. J. Sc., **4**, 39, 1897.

**Caswellite.** *A. H. Chester*, G. Rep. N. J., 1895. Trans. N. Y. Acad. Sci., **13**, 181, 1894. An altered mica of a light copper-red color and bronze-like luster resembling clintonite. Structure micaceous. Inelastic. H. = 2·5–3. G. = 3·54. Double refraction feeble. Not pleochroic. Analysis:

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | $Mn_2O_3$ | CaO | MgO | Ign. |
|---|---|---|---|---|---|---|
| 38·74 | 6·58 | 6·85 | 15·95 | 22·30 | 5·52 | 4·64 = 100·58 |

Occurs with rhodonite, polyadelphite and a dark-colored biotite, from which it is believed to have been derived at the Trotter mine, Franklin Furnace, N. J. Named after Mr. John H. Caswell.

**Cataphorite.** Kataforit, *W. C. Brögger*, Die Eruptivgest. d. Kristianiagebietes, **1**, 37, 73, 1894; **3**, 169, 1898, *et al.*

An alkali-iron amphibole, intermediate between barkevikite and arfvedsonite, but not yet analyzed. Occurs in the grorudite-tinguaite series of rocks of southern Norway. Cleavage-angle about 56°. Extinction-angle on *b* (010), $\mathfrak{c} \wedge \dot{c} = 30°$ to 60°. Predominating absorption-colors reddish; $\mathfrak{b} > \mathfrak{c} > \mathfrak{a}$. Lacroix gives for a similar amphibole (but nearer barkevikite) from the Haute-Loire. 2E = 60°; $\mathfrak{a}$ yellowish brown; $\mathfrak{b}$ violet; $\mathfrak{c}$ yellow, slightly greenish. Min. France, **1**, 689, 1898. Brögger suggests that the amphibole of pulaskite (J. Fr. Williams, Ign. Rocks Arkansas, p. 64) may also belong between barkevikite and cataphorite. See also *Barkevikite.*

CATAPLEIITE, p. 412.—Occurs at Kangerdluarsuk, Greenland, with neptunite, epididymite, ægirite, etc., in crystals with $(10\bar{1}3)$; G. = 2·743; analysis by Flink: $SiO_2$ 44·08, $ZrO_2$ 31·83, CaO 0·17, $Na_2O$ 14·80, $H_2O$ 9·12 = 100. This corresponds to a pure *natron-catapleiite*, G. För. Förh., **15**, 206, 1893.

**Cedarite.** *R. Klebs* [Jb. preuss. geol. Landesanst. 1896], Jb. Min., **2**, 212 ref., 1898. A fossil resin resembling amber somewhat widely distributed in the alluvium of the Saskatchewan river in Canada. Cold clear yellow, or clouded. Composition: C 78·15, H 9·89, O 11·20, S 0·31, ash 0·45 = 100. Partially soluble in the usual solvents.

CELESTITE, p. 905.—**Cryst.**—List of cryst. forms with references, also optical characters, etc. Grunenberg [Inaug. Diss., Breslau, 1892], Zs. Kr., **24**, 199, 1894. Brousseval, Ville-sur-Saulx, France, new form (1·10·10), Stöber, Zs. Kr., **21**, 339, 1893. From the Romagna with new forms (450), (230), (105), (087)?, (326), (562), Artini, Rend. Ist. Lomb. Sc., **26**, 323, 1893. Westeregln, Bücking, Ber. Ak. Berlin, 536, 1895. Giershagen Stadtberge, new forms *N* (705), *Q* (332), *R* (1·19·19), also discussion of variation in axial ratio, physical characters, etc., Arzruni and Thaddéeff, Zs. Kr., **25**, 38, 1895. Bessarabia, Prendel, Vh. Min. Ges., **34**, 185, 1896.

Occurs in Lansdowne township, Leeds Co., Ontario (anal. by Johnston, BaO *tr.*), Hoffmann, Rep. G. Canada, 7, 9 R, 1894; cf. also *ib.*, 5, 25 R, 1889–90.

A fibrous radiated variety from the Silurian crystallized limestone of Eastern Ontario gave C. W. Volney: $SrSO_4$ 70·01, $BaSO_4$ 30·85, $Al_2O_3,Fe_2O_3$ 0·005 = 100·865. G. = 4·123. J. Am. Ch. Soc., **21**, 386, 1899. Another specimen from Lansdowne, Ontario, gave, $SrSO_4$ 58·20, $BaSO_4$ 39·85 = 98·05. G. = 4·188. Still another celestite showed over 3 p. c. $BaSO_4$; G. = 4·41. *Ibid.*, **13**, 290, 1891. Cf. Hoffmann, above.

**Celsian.** *Hj. Sjögren*, G. För. Förh., **17**, 578, 1895.

Triclinic. Massive. Cleavage: *c* (001) perfect; *b* (010) distinct; *m* (110) and *M* (1$\bar{1}$0) less distinct. Angles: *bc* = 89° 34′–89° 37′, *cm* = 68° 30′–68° 45′, *bm* = 59° 18′. H. = 6 to 6·5. G. = 3·37. Luster vitreous. Colorless. Extinction on *c* inclined 3° 10′, and on *b*, 26° 45′ to edge b/c. Optic axis seen obliquely in sections ‖ *c*.

Composition analogous to that of anorthite, $BaAl_2Si_2O_8$ or $BaO.Al_2O_3.2SiO_2$. Analysis R. Mauzelius:

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | BaO | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ | F |
|---|---|---|---|---|---|---|---|---|---|
| 32·43 | 26·55 | 0·12 | 39·72 | 0·23 | 0·11 | 0·22 | 0·16 | 0·64 | 0·64 = 100·82 |

B. B. scarcely fusible even on thin splinters.

From the manganese mines of Jakobsberg, Sweden, with schefferite and manganophyllite. Named after Anders Celsius, the Swedish naturalist.

CELYPHITE.—Same as *Kelyphite*, p. 447.

CENOSITE, p. 698.—Described by Hj. Sjögren, from the Ko mines, Nordmark, Sweden; occurs with diopside, clinochlore, magnetite and apatite. Crystallization orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·9517 : 1 : 0·8832, or near those of cerite. Forms: *b* (010), *c* (001); *m* (110), *h* (230); *g* (201); *f* (023), *d* (011), *e* (021). Habit short prismatic. Angles: *mm‴* = 87° 10′, *mm′* = *92° 50′, *bd* = *48° 33′ (see below). Cleavage not observed. G. = 3·38. Luster greasy. Color yellow-brown to dark chestnut-brown. Analysis (on 0·067 gr.), R. Mauzelius:

| $SiO_2$ | $Y_2O_3$, etc. | $Fe_2O_3$ | CaO | MgO | Alk. | $H_2O$ | $CO_2$ |
|---|---|---|---|---|---|---|---|
| 31·7 | 35·9 | 2·9 | 16 5 | 1·4 | 3·6 | 2·9 | [5·1] = 100 |

The author gives *bd* = 41° 33′, which is obviously an error; 48° 33′ agrees with his axial ratio. G. För. För., **19**, 54, 1897.

CERUSSITE, pp. 286, 1030.—**Cryst.**—Pacaudière, Loire, and Roure, (Pontgibaud), France, Gonnard, Bull. Soc. Min., **15**, 35, 41, 1892. Norberg, twins, Johansson, G. För. Förh., **14**, 49, 1892 Black Hawk, Montana, Pratt, Am. J. Sc., **48**, 212, 1894. Cabo de Gata, Osann, Zs. Kr., **23**, 264, 1894. Tarnowitz, Silesia, new forms 𝔵 (441), 𝔣 (170), 𝔢 (025), 𝔤 (171); also on *iglesiasite*, from Radzionkau (3·4 ZnO), 𝔦 (210), Traube, Zs. G. Ges., **46**, 60, 1894. From the Galena limestone, Wisconsin, with the new form λ (0·25·4). Hobbs, Zs. Kr., **25**, 265, 1895, and Bull. Univ. Wisconsin, 1, 128, 1895; also from Missoula, with 𝔟 (380), *id.*, Am. J. Sc., **50**, 121, 1895. Gorno, Val Seriana, Italy, crystals described, with new form (0·13·1), Artini, Riv. Min. Ital., **16**, 21, 1896, and Rend. Ist. Lombardo, **30**, 1529, 1897. Nebida, Sardinia, Riva, Riv. Min. Ital., **18**, 54, 1898, and Rend. Accad. Linc., **6** (1), 421, 1897.

CHABAZITE, p. 589.—Tulferthal, Tyrol, crystals described (twins), Habert, Zs. Kr., **28**, 243, 1897. Investigation of the absorption of gases after having been partially deprived of water, G. Friedel (also other zeolites), Bull. Soc. Min., **19**, 102, 1896; **22**, 5, 1899. Also Rinne, Jb. Min., **2**, 28, 1897.

CHALCANTHITE, p. 944.—Etching-figures investigated, T. L. Walker, Am. J. Sc., **5**, 176, 1898. Occurs at the Avoca claim, Bonaparte river, Lillooet district, Br. Columbia, Hoffmann, Rep. G. Canada, **9**, 12 R, 1896.

CHALCOCITE, p. 55.—Crystals from Bristol, Conn., with (130) as tw.-plane, Kaiser, Zs. Kr., **24**, 498, 1895. From Montecatini, with new form (052), Boeris, Zs. Kr., **23**, 235, 1894, and Riv. Min. Ital., **14**, 26, 1895.

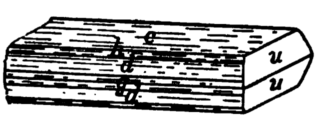
CHALCOPHANITE, p. 256.—*Hydrofranklinite* of Roepper (Min., p. 259) is shown by Penfield and Kreider (Am. J. Sc., **48**, 141, 1894) to be identical with chalcophanite. The form is not octahedal, but rhombohedral, a combination of *c* and *r*. Analysis: FeO 10·00, MnO 48·27, ZnO 18·25, O 11·21, $H_2O$ 11·85, insol. 0·25 = 99·83; G. = 4·012.

CHALCOPYRITE, pp. 80, 1030.—**Cryst.**—Westphalia, new form, *s* (5$\bar{2}$5), Cesàro, Bull. Ac. Belg., **28**, 182, 1894. Victoria mine, near Burgholdingshausen, Siegen, new forms (312), (534), Sonheur, Zs. Kr., 23, 545, 1894. Kis-Almás, Hungary, new forms $\tau$ (605), $\zeta$ (907), $\chi$ (704), Zimanyi, Zs. Kr., 27, 95, 1896. Harz Mts., Luedecke, Min. d. Harzes, 123, 1896.

Occurs at Müsen, in capillary forms, Laspeyres, Zs. Kr., 20, 529, 1892.

**Chalcostibite**, pp. 118, 1030.—Penfield and Frenzel have shown (Am. J. Sc., 4, 27, 1897, and Zs. Kr., 28, 598) that the guejarite of Cumenge (Min., pp. 110, 1030) is identical with chalcostibite (wolfsbergite*). Referred to the axial ratio $\breve{a} : \bar{b} : \dot{c} = 0{\cdot}5283 : 1 : 0{\cdot}6364$, which is that of Laspeyres (p. 1030, Wolfsberg cryst.) modified to correspond with the symbol 6·12·7 of *p* (not 7·14·8 Lasp.), the forms are: *b* (010), *c* (001), *h* (203), *d* (101), *i* (302), *g* (201), *t* (021), *u* (061). Analyses (Frenzel) 1, 2, below. G. = 4·959 Pfd.

1.



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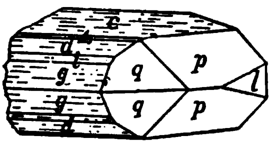

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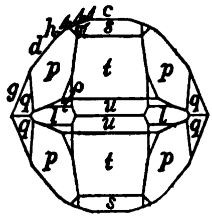

Guéjar.

Huanchaca, Bolivia.

Crystals of chalcostibite from the Pulacayo mine, Huanchaca, Bolivia, showed (l. c.) the new forms *l* (130), $\Delta$ (209), $\Delta_1$ (207), $\Delta_2$ (205), *s* (065), $\mu$ (136), $\nu$ (133), $\pi$ (265), $\rho$ (263), $\sigma$ (4·12·5), $\tau$ (261). The axial ratio deduced is $\breve{a} : \bar{b} : \dot{c} = 0{\cdot}5312 : 1 : 0{\cdot}63955$. Other crystals from the same locality examined by L. J. Spencer (quoted above) showed the additional forms: $\alpha$ (233), $\beta$ (354), $\gamma$ (474), $\delta$ (475), $\epsilon$ (476). The crystals are prismatic ∥ *b* and striated in this direction. Cleavage: basal, perfect; *a* and *b* also observed.

Analyses, Frenzel: 1 of chalcostibite from Guéjar, G. = 4·96; 2 of the original guejarite; 3 of chalcostibite from Bolivia:

| | S | Sb | Cu | Pb | Fe |
|---|---|---|---|---|---|
| 1. Guéjar | 26·28 | 48·86 | 24·44 | 0·58 | 0.42 = 100·58 |
| 2. " | 26·12 | 48·44 | 25·23 | 0·32 | 0·49 Zn 0·18 = 100·78 |
| 3. Huanchaca | 26·20 | 48·45 | 24·72 | — | — = 99·37 |

**Chlorastrolite**, p. 610.—Examined by N. H. Winchell, who concludes that, while the material may be somewhat impure (delessite, etc.), it has constant and distinguishing optical characters. Occurs in small round pebbles with fine fibrous, stellate structure. H. = 5·5. G. = 3·155. Color light and dark green. Fibers elongated ∥ b. Extinction oblique, to 20°. Refractive index higher than for thomsonite. Pleochroism: distinct, colorless and light green. From Isle Royale, Lake Superior. Remarks are also made on the possible relation of "zonochlorite" to chlorastrolite and mesolite. Amer. Geol., 23, 116, 1899.

**Chlorites**, pp. 643–664.—Discussion of composition and analyses, F. W. Clarke and Schneider, Am. J. Sc., 43, 378, 1892. Also Bull. U. S. G. Surv., 113, 11, 27, 1893.

See also *Clinochlore*, *Penninite*, etc.

**Chloritoid**, pp. 640, 1081.—Occurs in blocks on the south shore of Michigamme lake, Mich., W. H. Hobbs (anal. Kahlenberg), Am. J. Sc., 50, 121, 1895; 2, 87, 1896; cf. Lane and Keller, Min., p. 1081, also Rominger, Geol. Surv. Michigan, vol. 5, p. 31.

From Lainicium, Carpathian Mts., anal., Duparc and Mrazek, C. R., 116, 601, 1893. Also in Kincardineshire described (anal.) by G. Barrow, Q. J. G. Soc., 54, 149, 1898.

See also *Ottrelite*.

**Chloroarsenian.** *L. J. Igelström*, G. För. Förh., 15, 471, 1893; Zs. Kr., 22, 468. An imperfectly described mineral occurring with basiliite (p. 9) at the Sjö mine, Örebro, Sweden. In crystals, showing one cleavage and having a vitreous luster and yellowish green color. Contains MnO and $As_2O_5$ (or $As_2O_3$), but no $Sb_2O_5$ nor $H_2O$. It is to be regretted in the case of this and other supposed new minerals from the same locality that the name was not withheld until they could be adequately described according to scientific methods.

**Chondrodite**, p. 535.—See *Humite*.

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* The probable identity of chalcostibite and guejarite was urged by L. J. Spencer in 1896. See Min. Mag., 11, pp. x and 188, 1897.

**Chondrostibian.** *L. J. Igelström*, G. För. Förh., 15, 343, 1893; Zs. Kr., 22, 43, 1893. In grains and perhaps also in octahedral crystals (?) embedded in barite at the Sjö mine, Örebro, Sweden. Color dark brownish red to yellowish red in small grains. Feebly magnetic. An analysis on very impure material gave after the deduction of 51 p. c. of foreign substances (calcite, tephroite, barite, etc.): $Sb_2O_5$ 30·66, $As_2O_5$ 2·10, $Mn_2O_3$ 33·13, $Fe_2O_3$ 15·10, $H_2O$ 19·01 = 100. The result thus obtained has obviously little claim to accuracy.

CHROMITE, pp. 228, 1031.—Crystals from the Bendegó meteoric iron show the forms (111), (110), (311), (221); (001) rare; also faces of (510), (310), (210), (211), (553), (774)?, (552)?, (331), (441). Hussak, quoted by Derby, Arch. Mus. Nacional de Rio de Janeiro, p. 165, 1896.

A variety (*magnochromite*) from Tampadel, Zobtengebirge, Lower Silesia, gave Laszczyński (quoted by Traube, Zs. G. Ges., 46, 52, 1894): $Cr_2O_3$ 41·23, $Al_2O_3$ 24·58, FeO 19·04, MnO 0·58, MgO 14·77 = 100·20; the iron may be partly $Fe_2O_3$. G. = 4·21.

J. H. Pratt, discussing the occurrence and origin of chromite (Am. J. Sc., 7, 281, 1899), has proposed the name *mitchellite*, after Prof. Elisha Mitchell of North Carolina (1793–1857), for a magnesian variety represented by the mineral from Webster, N. C. An analysis by H. W. Foote gave:

| $Cr_2O_3$ | $Al_2O_3$ | FeO | MgO |
|---|---|---|---|
| 39·95 | 29·28 | 13·90 | 17·31 = 100·44. |

The calculated formula is $2MgAl_2O_4.MgCr_2O_4.FeCr_2O_4$. This corresponds closely to the magnochromite of Bock (Min., p. 228) and to the similar mineral from Tampadel, Silesia, noted above.

CHRYSOLITE, pp. 441, 1031.—Crystals from Monte delle Croce, near Montefiascone, described and measured, Fantappié, Riv. Min. Ital., 17, 3, 1897.

A minute discussion of the form, composition, etc., of minerals of the Chrysolite Group is given by Thaddéeff, Zs. Kr., 26, 28, 1896.

Crystals altered to serpentine from Middlefield, Mass., Emerson, Bull. Amer. G. Soc., 6, 473; Bull. U. S. G. Surv., 126, 152, 1895.

An alteration-product from the north shore of L. Superior is referred to bowlingite (Min., p. 682) by Winchell, Amer. Geol., 23, 43, 1899. See also *Iddingsite.*

A lead-zink chrysolite (*Bleizinkchrysolith*) from a slag is noted by Heberdey, Zs. Kr., 21, 61, 1892.

CINNABAR, pp. 66, 1031.—Occurs in fine crystals at Ouen-Shan-Tchiang, central China, Termier, Bull. Soc. Min., 20, 204, 1897.

On occurrences in Canada, see Hoffmann, Rep. G. Canada, 5, 66 R, 1889–90; 6, 31 R, 1892–93. The occurrence in Southern Texas near the Rio Grande (Long. 27° W., Lat. 29° 30′ N.) is described by W. P. Blake (Trans. Am. Inst. Mng. Eng., March, 1895); in grains and small rhombohedral crystals.

On synthesis, Ippen, Min. petr. Mitth., 14, 114, 1894.

CLEVEITE, p. 889.—See *Uraninite.*

CLINOCHLORE, p. 644.—Crystals from the Ural described, Jeremejev, Vh. Min. Ges., 31, 417, 1894.

A discussion of optical characters specially with reference to the relations of clinochlore and penninite is given by Klein, Jb. Min., 2, 119–132, 1895. Clinochlore is found to be always optically *positive*, even when it becomes uniaxial on heating; penninite, however, is *negative.*

Analyses of specimens from Zlatoust (also leuchtenbergite), Clarke and Schneider, Am. J. Sc., 43, 378, 1892.

From Buckingham, Ottawa Co., Quebec, and Bagot township, Renfrew Co., Ontario (analyses by Johnston), Hoffmann, Rep. G. Canada, 6, 17 R, 1892–93.

CLINOCLASITE, p. 795.—Analysis by Church, Min. Mag., 11, 4, 1895.

**Clinohedrite**, *S. L. Penfield* and *H. W. Foote*, Am. J. Sc., 5, 289, 1898.

Monoclinic-clinohedral. Axes $\dot{a} : \bar{b} : \dot{c}$ = 0·68245 : 1 : 0·3226; $\beta$ = 76° 2½′ = 100 ∧ 001. Angles 100 ∧ 100 = 33° 31′, 001 ∧ 011 = 17° 23′, 001 ∧ 101 = 22° 22·9′. *bm* = * 56° 29′, *pp′* = * 29° 8′, *mp* = * 51° 54′. Observed forms: *b* (010), *h* (320), *m* (110), $m_1$ $(\bar{1}10)$, *n* (120), *l* (130); *e* $(\bar{1}01)$, $e_1$ $(\bar{1}0\bar{1})$, *p* (111), $p_1$ $(\bar{1}1\bar{1})$, *q* $(\bar{1}11)$, $q_1$ $(11\bar{1})$, *r* $(\bar{3}31)$, *s* $(\bar{5}51)$, *t* $(\bar{7}71)$, *u* $(\bar{5}31)$, *o* (131), $o_1$ $(13\bar{1})$, *x* $(\bar{1}3\bar{1})$, *y* $(\bar{1}2\bar{1})$. Habit of crystals varied as shown in figures, but conforming to the group under the monoclinic system (clinohedral or domatic group) which has a plane of symmetry, but no axis of symmetry.

Cleavage: *b* (010) perfect. Brittle. H. = 5·5. G. = 3·33. Luster vitreous. Colorless to white and amethystine. Transparent. Optically —. Birefringence not high. Ax. pl. and $Bx_o \perp b$. $\bar{b} \wedge \dot{c} = -28°$. Strongly pyroelectric.

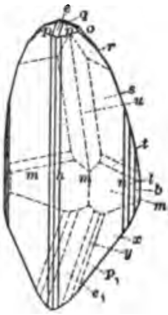
Composition analogous to calamine, $H_2ZnCaSiO_5$ or $(ZnOH)(CaOH)SiO_3$; this requires: Silica 27·92, zinc protoxide 37·67, lime 26·04, water 8·37 = 100. Analysis (Foote):

5

| | $SiO_2$ | ZnO | MnO | CaO | MgO | $H_2O$ | $(Fe,Al)_2O_3$ |
|---|---|---|---|---|---|---|---|
| [illegible] | 27·22 | 37·44 | 0·50 | 26·25 | 0·07 | 8·56 | 0·28 = 100 32 |

B.B. exfoliates and then fuses at 4 to a yellowish enamel; the water is expelled at a faint red heat. Yields a coating of zinc oxide on charcoal. Dissolves readily when powdered in hydrochloric acid, yielding gelatinous silica on evaporation.

1.



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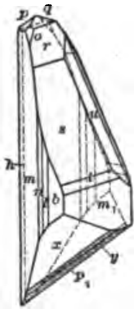

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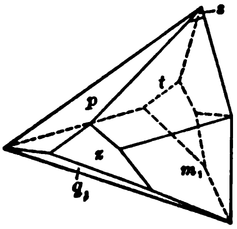

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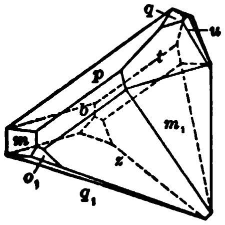


From the Trotter mine, Franklin Furnace, N. J., associated with willemite, brown garnet, axinite, datolite, phlogopite. This name had previously been used for a variety of tetrahedrite supposed (Breithaupt) to differ from others in form.

**Clinozoisite.** Klinozoisit. *E. Weinschenk*, Zs. Kr., **26**, 161, 433, 1896. A name proposed for those members of the zoisite-epidote group, which are near zoisite in composition but monoclinic in crystallization; they are further optically + and of feebler refringence and birefringence than typical epidote; zoisite is regarded as dimorphous with epidote. To clinozoisite belong crystals, like epidote in habit, from rolled pebbles at the foot of the Goslerwand, Prägratten, Tyrol. Color pale rose-red, transparent. Optically +. $Bx_a \wedge \dot{c} = 2°$. $\beta = 1·7195$. $\gamma - \alpha = 0·0056$. $2V_y = 81° 40'$. Analysis gave:

| | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | CaO | $H_2O$ |
|---|---|---|---|---|---|---|---|
| G. = 3·372 | 39·06 | 32·57 | 1·68 | 0·29 | *tr.* | 24·53 | 0·01 = 100·14 |

An epidote from the Rothenkopf, Zillerthal, with only 3·52 $Fe_2O_3$, was optically *negative*, with $\gamma - \alpha = 0·0105$. See also *Fouquéite* (Min., p. 1035) and *Zoisite*.

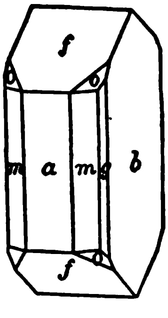
**Cobaltite**, p. 89.—From Siegen, twins with *o* (111) as tw.-plane, Laspeyres, Zs. Kr., **20**, 550, 1892.

**Cohenite**, pp. 31, 1038.—Noted in the Bendegó, Brazil, meteoric iron, in dendritic aggregates, also in isolated isometric crystals with the forms *a* (100), *o* (111), *d* (110), *p* (221), *β* (322), (944)? Hussak, quoted by Derby, Arch. Mus. Rio de Janeiro, p. 160, 1896. Also described from other meteoric irons (Cohen) and in the terrestrial iron of Niakornak, Greenland. Analyses by Cohen, Medd. om Grönland, **15**, 293, 1897.

**Colemanite**, p. 882.—Anomalous etching-figures examined, Baumhauer, Zs. Kr., **30**, 97, 1898.

**Columbite**, p. 731.—Crystals of a mangano-columbite from Rumford, Me., are described by H. W. Foote (Figs. 1, 2). G. = 6·44, color dark reddish brown, Am. J. Sc., **1**, 460, 1896.

1.



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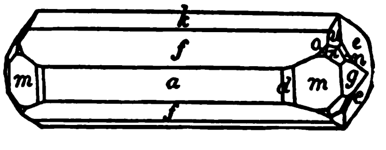


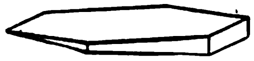
Analysis from North Carolina, Khrushchov, Vh. Min. Ges., 31, 412, 1894.

Occurs (G. = 5·36) in the township of Sebastopol, Renfrew Co., Ontario, W. G. Miller, Rep't Bureau of Mines, 7, Part III, p. 234, Toronto, 1898.

See also *Tantalite* and *Tapiolite*.

**Cookeite**, p. 625.—From Hebron, Me., analyzed by Penfield, Am. J. Sc., 45, 393, 1893, and shown to have the formula $Li[Al(OH)]_3[SiO_3]_2$. Crystallization monoclinic, the crystals often formed of wedge-shaped cleavage-plates grouped as in figures 1–3; the center *a* of 3 uniaxial. Analysis:

1.



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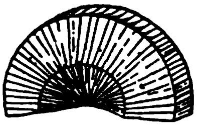

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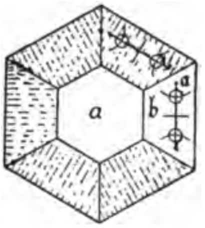


| | | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | $K_2O$ | $Na_2O$ | $Li_2O$ | $H_2O$ | F |
|---|---|---|---|---|---|---|---|---|---|---|
| G. = 2·675 | ‡ | 34·00 | 45·06 | 0·45 | 0·04 | 0·14 | 0·19 | 4·02 | 14·96 | 0·46 = 99·32 |

A mineral referred here by Hoffmann occurs in the sericite-schist of Wait-a-bit creek, Columbia river, British Columbia (analysis by Johnston), Rep. G. Canada, 6, 22 R, 1892–93.

**Copper**, p. 20.—Crystals in aventurine glass described, Washington, Am. J. Sc., 48, 411, 1894.

Crystals from Burra-Burra, S. Australia, are covered with an incrustation of minute crystals of cuprite in parallel position with it, Mügge, Jb. Min., 2, 151, 1898.

Occurs at Franklin Furnace, N. J., J. E. Wolff, Proc. Am. Acad., 33, 429, 1898.

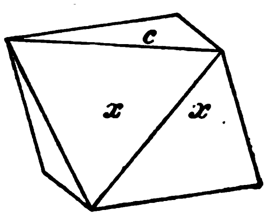
**Cordierite**.—See *Iolite*.

**Corundum**, pp. 210, 1031.—Description of twin crystal (showing the new form $(5 \cdot 5 \cdot \bar{10} \cdot 4)$) with *r* $(10\bar{1}1)$ as tw.-plane; also a similar contact-trilling, etc., H. Barvíř, Ann. Mus. Wien, 2, 135, 1892.

Discussion of planes of parting, viz., parallel to *c* (0001), *a* $(11\bar{2}0)$, both normal "solution-planes"; also *r* $(10\bar{1}1)$, a gliding plane and sometimes a secondary solution-plane, Judd, Min. Mag., 11, 49, 1895.

Pratt has described crystals of sapphire (Figs. 1–3) from Yogo Gulch, Montana, with *x* $(30\bar{3}2)$; also showing natural etching-figures, Am. J. Sc., 4, 424, 1897. See also below. Bauer notes the new form r $(01\bar{1}2)$ on Burma rubies, Jb. Min., 2, 197, 1896.

1.



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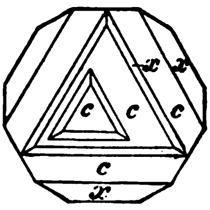

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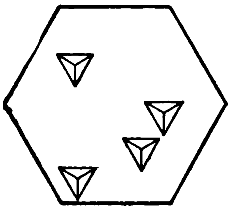


Investigations of hardness of minerals in the scale of Mohs compared with corundum, Rosiwal, Vh. G. Reichs., 475, 1896. See also Auerbach, Wied. Ann., 58, 357, 1896; Jaggar (microsclerometer), Am. J. Sc., 4, 399, 1897.

In regard to the *occurrence* of corundum, recent investigations show that it is often associated with igneous rocks and is itself of igneous origin, though also of secondary origin in crystalline limestone and, further, the result of contact-metamorphism. These subjects have been discussed by the following authors:

On the occurrence and origin of the rubies of Burma (and associated minerals), C. Barrington Brown and J. W. Judd, Phil. Trans., 187 (A), 151-228, 1896. See also Bauer, l. c.; on the rubies of Siam, Louis, Min. Mag., 10, 267, 1894.

On the corundum of India, T. H. Holland, Geol. India, 2d Ed., Part I, pp. 1–79, Calcutta, 1898. See also Judd, Min. Mag., 11, 56, 1895.

Corundum deposits of Georgia, F. P. King. Geol. Surv. Georgia, Bull. 2, 1894. Associated with peridotite of N. Carolina, igneous origin discussed, Pratt, Am. J. Sc., 6, 49, 1898.

Sapphire of Yogo Gulch, Fergus Co., and elsewhere, Montana, Kunz, Am. J. Sc., 4, 417, 1897; Pirsson, *ibid.*, p. 421.

Corundum of Eastern Ontario, W. G. Miller, Rep. Bureau of Mines, Vol. 7, Pt. III, Toronto, 1898.

Produced by contact-metamorphism on the border of the Dartmoor granite, Devonshire, Busz, Geol. Mag., 3, 492, 1896.

Experimental investigation of conditions of formation in a magma, Morozewicz, Min. petr. Mitth., 18, 23, 202, 1898; see also Zs. Kr., 24, 281, 1894.

Description of emery from Naxos, Tschermak, Min. petr. Mitth., 14, 311, 1894.

**Cosmochlore.** Kosmochlor, *Laspeyres*, Zs. Kr., 27, 592, 1896. Kosmochromit, Groth, Tab. Ueb., 132, 1898.

Monoclinic, probably. In embedded splinters, showing, in thin sections, cleavages parallel to *a* (100), *b* (010), also less distinct prismatic (30° and 150°). H. = 5–6. Color emerald-green, strongly pleochroic. Extinction oblique. $\mathfrak{a} \wedge \dot{c} = 12^\circ$. Birefringence high. Ax. pl. ∥ *b* (010).

In composition a chromium silicate. An approximate analysis (on 0·003 gr.) gave:

| $SiO_2$ | $Cr_2O_3$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO |
|---|---|---|---|---|---|
| 31·82 | 39·39 | 9·09 | 9·09 | 6·06 | 4·55 = 100. |

Identified in minute amount in the stony portion of the Toluca meteoric iron. The author found also orthoclase, plagioclase, pyroxene, quartz, zircon, chromite, and others not fully determined, perhaps new.

COTUNNITE, p. 165.—Study of artificial crystals, Stöber, Bull. Ac. Belg., 30, 345, 1895.

**Courtzilite.** 17th Ann. Rep. U. S. G. Surv., Part III., p. 752, 1895–96. A form of asphaltum allied to uintahite (gilsonite), etc.

COVELLITE, p. 68. Occurs in fine indigo-blue masses at the East Gray Rock mine, Butte, Montana; analysis by Hillebrand, Am. J. Sc., 7, 56, 1899. Also massive from La Sal mine, La Sal distr., Utah; in plates from Rio Grande Co., Colo. (Pfd.).

CROCOITE, p. 913.—Crystals from Penchalonga, Mashonaland, described (new form 403), Redlich, Zs. Kr., 27, 607, 1896. See also Alford, Q. J. G. Soc., 50, 8, 1894.

Occurs finely crystallized at the Adelaide mine, Mt. Dundas, Tasmania, new forms *S* (10·3·0), *T* (530), Palache, Am. J. Sc., 1, 389, 1896. On the occurrence in Tasmania, see also Petterd, Min. Tasmania, p. 24, 1893, p. 30, 1896; further, Liversidge (anal.), Proc. R. Soc. N. S. W., 29, 318, 1895.

Obtained in minute crystals by exposing for several months to the air a solution of lead chromate in caustic potash, Ludeking, Am. J. Sc., 44, 57, 1892.

**Crossite.** *Charles Palache*, Bull. G. Univ. California, 1, 181, 1894.

A mineral of the amphibole group, characterized by its blue color, occurring somewhat widely distributed in the crystalline schists of the Coast Ranges of California. The following description belongs to specimens from near Berkeley:

Occurs in lath-shaped crystals; also in irregular prisms and rounded grains. Form and cleavage like ordinary amphibole. G. = 3·16. Color fine blue, yellowish blue. Pleochroism strong: $\mathfrak{c}$ brown to greenish yellow; $\mathfrak{b}$ reddish or bluish violet; $\mathfrak{a}$ deep blue. Absorption $\mathfrak{a} \geqq \mathfrak{b} > \mathfrak{c}$. Ax. pl. ∥ *b* (010). $\mathfrak{a} \wedge \dot{c} = 13^\circ$ (assumed as $+13^\circ$)..

In composition between glaucophane and riebeckite, being optically more nearly related to the latter. Analysis, W. S. T. Smith:

| SiO | $Al_2O_3$ | $Fe_2O_3$ | FeO | MgO | CaO | $Na_2O$ | $K_2O$ | |
|---|---|---|---|---|---|---|---|---|
| 55·02 | 4·75 | 10·91 | 9·46 | 9·30 | 2·38 | 7·62 | 0·27 | MnO *tr.*, $H_2O$ *undet.* = 99·76 |

Named after Mr. Whitman Cross of the U. S. Geol. Survey.

A blue amphibole of like optical characters occurs as a secondary growth on brown hornblende and on pyroxene in Custer Co., Colorado, (cf. Min., p. 402, where it is provisionally placed under arfvedsonite).

CRYOLITE, pp. 166, 1032.—Description of twin crystals, Baumhauer, Zs. Kr., 24, 87, 1894.

CRYSTALLITES.—Discussion of various forms with introduction of new names: clavalite, spiculite, bacillite, scopulite, arculite, rotulite, furculite, crenulite, Rutley, Min. Mag., 9, 261, 1891.

**Cubaite.**—See *Quartz.*

CUBANITE, p. 79—Analyses of a mineral having the external characters of Breithaupt's species gave Schneider:

| | | | |
|---|---|---|---|
| 1. | S 34·37 | Cu 24·32 | Fe 41·15 = 98·84 |
| 2. | 34·01 | 23·00 | 42·51 = 99·52 |

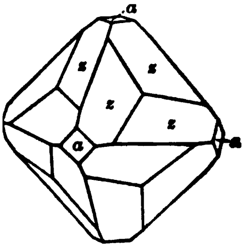
This leads to the formula $CuFe_2S_3$, agreeing with the analysis of Scheidauer (anal. 4, Min., p. 79). For the mineral analyzed by Eastwick and others (anals. 1–3, *ibid.*) which corresponds to $CuFe_2S_4$, the author proposes the name *barracanite* or *cupropyrite*. J. pr. Ch., **52**, 555, 1895.

**Cubeite.** Kubeit, *L. Darapsky*, Jb. Min., **1**, 168, 1898. This name was earlier suggested for an imperfectly known iron sulphate from the neighborhood of the Loa river, desert of Atacama. Now obtained in druses of elongated rhombic or monclinic double pyramids. Brittle, of vitreous luster. Analysis gave: $SO_3$ 36·4, $Fe_2O_3$ 19·3, MgO 7·8, $H_2O$ 33·7, CaO [0·1], insol. 2·7 = 100.

**Cumengéite.** *E. Mallard*, Bull. Soc. **Min.**, **16**, **184**, **1893**. **Cumengite.—See** *Percylite.*

CUPRITE, p. 206.—Etching-figures do not show the trapezohedral symmetry sometimes exhibited in the distribution of the faces. Traube, Jb. Min., Beil.-Bd., **10**, 455, 1896. Fig. shows a crystal from Cornwall, drawn by J. H. Pratt (priv. contr.), in which the trapezohedral symmetry is marked.

See also *Copper.*



Cuprite.

**Cuprocassiterite.** *Titus Ulke*, Trans. Am. Inst. Mng. Eng., **21**, 240, Feb. 1892.—See *Stannite.*

**Cuproiodargyrite.** *H. Schulze* [Ch. Ztg., **16**, 1952, 1892], Zs. Kr., **24**, 626, 1895.

Occurs as an incrustation or filling crevices in limestone. Somewhat harder and less sectile than iodyrite. Color sulphur-yellow. Translucent. Composition CuI.AgI. Analysis: I 57·75, Ag 25·58, Cu 15·91 = 99·24. Occurs at the mine San Agustin, Huantajaya, near Iquique, Chili, as a decomposition-product of stromeyerite.

CUPROPLUMBITE, p. 51.—From Butte City, Montana, analysis by J. T. De Bell: S 17·77, Cu 61·32, Pb 18·97, quartz 1·58 = 90·64. This gives $5Cu_2S.PbS$. The corrected specific gravity (5·39) is shown to correspond with that called for (5·45) on the supposition that it is to be classed with isometric galena, Am. Ch. J., **14**, 620, 1892.

From Semipalatinsk, anal. by Antipov, Vh. Min. Ges., **28**, 527, 1891, and Zs. Kr., **23**, 275, 1894.

CYANITE, p. 500.—Etching-figures investigated, Traube, Jb. Min., Beil.-Bd., **10**, 459, 1896; same by T. L. Walker, Am. J. Sc., **5**, 181, 1898.

Occurs in rich grass-green crystals with *t* (520), often perfectly transparent, on North Toe river, Yancey Co., N. C.; also pale green cyanite elsewhere in the state, Pratt, Am. J. Sc., **5**, 126, 1898.

**Cylindrite.** Kylindrit, *A. Frenzel*, Jb. Min., **2**, 125, 1893.

Massive; in cylindrical forms separating under pressure into distinct shells or folia, difficult to pulverize, like graphite. Soft; H. = 2·5–3. G. = 5·42. Luster metallic. Color blackish lead-gray. Streak black.

Composition, $Pb_6Sb_2Sn_6S_{21}$ or $3PbS.Sb_2S_3 + 3(PbS.2SnS_2)$. Analysis:

| S | Sn | Sb | Pb | Ag | Fe |
|---|---|---|---|---|---|
| 24·50 | 26·37 | 8·73 | 35·41 | 0·62 | 3·00 = 98·63 |

Obtained from the Mine Santa Cruz, at Poopó, Bolivia. The same country has also afforded the allied minerals plumbostannite, Min., p. 108; franckeite, this App., p. 26; also canfieldite, *ib.*, p. 13.

CYRTOLITE, p. 487.—See *Zircon.*

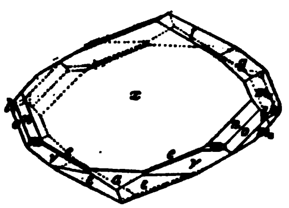
DAHLLITE, p. 866.—Shown by Hamberg to be an alteration-product of apatite somewhat analogous to staffelite (Min., p. 764). G. För. Förh., **13**, 802, 1891.

**Danalite**, pp. 485, 1082.—Occurs at Redruth, Cornwall, in large rough tetrahedral crystals, of a columbine-red; H. = 5·5; G. = 3·350. Analysis: $SiO_2$ 29·48, FeO 37·58, MnO 11·53, ZnO 4·87, BeO 14·17, CaO *tr.*, S 5·04 = 102·62. Calculated ratio, $SiO_2 : RO : RS = 3 : 7 : 1$ nearly. Miers and Prior, Min. Mag., 10, 10, 1892.

**Danburite**, p. 490.—Occurs in crystals in the Cimina region, Rome, Italy; in erratic blocks with davyne, tourmaline, etc., Fantappié, Riv. Min. Ital., **16**, 82, 1896; **18**, 7, 1898; also Rend. Accad. Linc., **5** (2), 108, 1896.

**Darapskite**, p. 873.—Shown by Osann to be monoclinic. Axial ratio $\grave{a} : \bar{b} : \grave{c} = 1·5258 : 1 : 0·7514$. $\beta = 77° 5' = 001 \wedge 100$. $100 \wedge 110 = 56° 5'$, $001 \wedge 101 = 23° 23'$, $001 \wedge 011 = 36° 13'$. Observed forms: *a* (100), *b* (010), *c* (001); *m* (110); *r* (101), *e* (302); *n* $(\bar{1}01)$, *d* $(\bar{2}01)$; *q* (011); *o* (111), *s* $(\bar{1}11)$, *v* (121). Angles: *ac* = *77° 5′, *am* = *56° 5′, *ar* = *53° 42′, *cr* = 23° 23′. Crystals tabular ∥ *a*; often twins, tw. pl. *a*. Cleavage: *a* perfect. Ax. pl. ⊥ *b*, *b* = *x*. Axial angle large. H. = 2–3. G. = 2·203. Zs. Kr., **23**, 584, 1894.

Artificial formation, A. de Schulten, Bull. Soc. Min., **19**, 161, 1896.



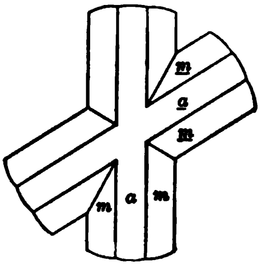
Datolite.

**Datolite**, p. 502.—**Cryst.**—Loughboro, Ontario, description of large crystals, prismatic ∥ *d*, Pirsson, Am. J. Sc., **45**, 100, 1893. Lake Superior, Osann, Zs. Kr., **24**, 543, 1895. Harz Mts., Luedecke, Min. Harzes, 418, 1896. Guanajuato, Mexico, crystals, tabular ∥ *x* (102) (Fig.), Farrington, Am. J. Sc., **5**, 285, 1898.

Etching-figures investigated and figured, Baumhauer, Die Resultate d. Aetzmethode, 1894.

Analysis, Grand Marais, Minn., Berkey, 23 Ann. Rept. Minn. G. Surv., p. 197.

**Davyne**, p. 428.—Occurrence in the Cimina region near Rome, see *Danburite*.



Derbylite.

**Derbylite.** *E. Hussak* and *G. T. Prior*, Min. Mag., **11**, 85, 176, 1897.

Orthorhombic. Axes $\breve{a} : \bar{b} : \grave{c} = 0·9661 : 1 : 0·5502$. Forms: *a* (100), *c* (001), *m* (110); also (011) as tw. pl. Angles: *am* = *44° 0¾′, $c \wedge 011 = 28° 49½'$, *mm* = 39° 8½′ Hussak. In slender prismatic crystals, 2 to 3 mm. long; often in cruciform twins crossing at an angle of 57° 39′; rarely in trillings.

Fracture conchoidal. Very brittle. H. = 5. G. = 4·512–4·530. Luster resinous. Color pitch-black, dark brown and translucent in thin splinters.

Composition perhaps $FeO.Sb_2O_5 + 5FeO.TiO_2$. Analysis on material not entirely pure (hence $SiO_2$, etc.), Prior:

| $Sb_2O_5$ | $TiO_2$ | FeO | CaO | $SiO_2$ | $Al_2O_3$ | $Na_2O$ | $K_2O$ | ign |
|---|---|---|---|---|---|---|---|---|
| 24·19 | 34·56 | 32·10 | 0·32 | 3·50 | 3·17 | 0·76 | 0·28 | 0·50 = 99·38 |

B.B. in salt of phosphorus gives a bead (R.F.) yellow when hot, violet when cold. Insoluble in acid, but decomposed by acid potassium sulphate.

Occurs in the cinnabar-bearing gravel of Tres Cruzes, Tripuhy near Ouro Preto, Mina Geraes, Brazil; lewisite, xenotime, monazite, zircon, rutile, etc., are associated. Named after Dr. O. A. Derby, Director of the Geological Survey of Brazil.

**Descloizite**, p. 787.—Analyses, from Obir, Carinthia, Brunlechner, Zs. Kr., **24**, 626, 1895.

**Diamond**, pp. 3, 1033.—Crystals from the Ural described with (971), (432), Jeremejev, Vh. Min. Ges., **34**, 59, 1896.

Artificial corrosion-figures, Luzi, Ber. Ch. Ges., **25**, 2470, 1892.

Refractive indices measured, Wülfing, Min. petr. Mitth., 15, 61, 1895. Investigation of variation of refractive indices with the temperature, A. Sella, Riv. Min. Ital., **10**, 65, 1892. Thermal expansion, J. Joly, Nature, **49**, 480, 1894.

Shown to be transparent to X-rays (while paste is opaque), also investigation of behavior of many species toward *X-rays*, Doelter, Jb. Min., **2**, 87, 1896; **1**, 256, 1897. (See further on the general subject, Zs. Kr., **30**, 610, 1899.)

Found in the glacial drift of Wisconsin, at Plum Creek, Pierce Co.; Oregon, Dane Co.; Kohlsville, Washington Co. (21½ carats); Eagle, Waukesha Co. (16 carats), cf. Kunz, Bull. G. Soc. Am, **2**, 638, 1891, and Min. Res. U. S.; Hobbs, Amer. Geol., **14**, 31, 1894; Bull. Univ. Wisconsin, 1, 152, 1895.

Occurrence and origin in California, Turner, Amer. Geol., **23**, 182, 1899. Also in South Africa, Stone, Bonney and Raisin, Geol. Mag., **2**, 492, 1895; Moissan, C. R., **116**, 292, 458, 460; **117**, 423, 1893. Description of the Kimberley mines, Stelzner, Isis, p. 71, 1893. Discussion of origin as illustrated in Brazil, Derby, J. Geol., **6**, 121, 1898.

See also the works of L. de Launay and H. Carvill Lewis noted in the bibliography.

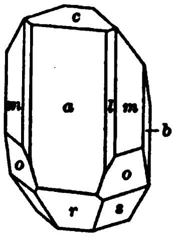
In the meteoric iron of Cañon Diablo, Arizona, A. E. Foote, Am. J. Sc., **42**, 413, 1891; Kunz and Huntington, Am. J. Sc., **46**, 470, 1893. Also C. Friedel, Bull. Soc. Min., **15**, 258, 1892 (C. R., **115**, 1037, 1892); **116**, 290, 1893. Also Moissan, C. R., **116**, 288, 1893 (Bull. Soc. Chim., **9**, 967, 1893). Occurrence in meteorites in general, Huntington, Proc. Amer. Acad., **29**, 204, 1894.

Formed artificially, Moissan, C. R., **116**, 218, 1893; Friedel, *ibid*, p. 224; Rousseau, *ib.*, **117**, 164; further, Moissan, *ib.*, **118**, 320, 1894; **123**, 206, 210, 1896. Also J. Friedländer, Berlin, 1898, Jb. Min., **1**, 202, 1899. Reproduction, Q. Majorana, Riv. Min. Ital., **19**, 22, 1898.

**DIAPHORITE**, p. 124.—Identified by L. J. Spencer (Am. J. Sc., **6**, 316, 1898) with pyrargyrite, galena, dolomite on a specimen of stephanite from the Lake Chelan, distr., Okanogan Co., Washington; also with miargyrite, etc., from Santa Maria de Catorze, San Luis Potosi, Mexico.

**Dicksbergite.** *L. J. Igelström*, G. För. Förh., 18, 231, 1896. A supposed new species occurring with cyanite at Dicksberg, Ransät parish, Wermland, Sweden. Shown by Weibull and Upmark (*ibid.*, p. 523) to be *rutile*.

**Dietzeite.** *A. Osann*, Zs. Kr., 23, 588, 1894.



Monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1{\cdot}3826 : 1 : 0{\cdot}9515$; $\beta = {}^*73^\circ\ 28' = 001 \wedge 100$. $100 \wedge 110 = {}^*52^\circ\ 58'$, $001 \wedge \bar{1}01 = 39^\circ\ 22'$, $001 \wedge 011 = 42^\circ\ 22\tfrac{1}{2}'$. Observed forms: *a* (100), *b* (010), *c* (001); *l* (210), *m* (110); *r* ($\bar{1}01$), *s* ($\bar{2}23$), *o* ($\bar{2}21$). Angles: $mm''' = 105^\circ\ 56'$, $a'r = {}^*67^\circ\ 10'$, $cm = 80^\circ\ 8'$. Crystals prismatic, tabular ∥ *a* and elongated ∥ $\dot{c}$. Commonly fibrous to columnar.

Cleavage: *a* imperfect. Fracture conchoidal. H. = 3–4. G. = 3·698. Luster vitreous. Color dark gold-yellow. Optically +. Ax. pl. ⊥ *b*. $\mathrm{Bx_o} \perp a$ in obtuse angle $\dot{c}\,\breve{a}$; extinction on *b* (010) 5° to 7° with $\dot{c}$. $2\mathrm{G}_{a.y} = 87^\circ$ to 88°. Dispersion horizontal and $v > \rho$, both strongly marked.

Composition, $7\mathrm{Ca(IO_3)_2.8CaCrO_4}$. Soluble in hot water; from the solution the colorless calcium iodate ($\mathrm{Ca(IO_3)_2} + 6\mathrm{H_2O}$) separates on cooling, leaving the calcium chromate in solution.

Obtained from the same region which furnished the calcium iodate lautarite (Min., p. 1040). The occurrence of this salt was earlier described by Dietze (after whom it is named), see Min., l. c.

**DIOPSIDE.**—See *Pyroxene.*

**DIOPTASE**, pp. 463, 1033.—Occurs in crystals in the neighborhood of Mindouli, east of Comba, on the road to Brazzaville, French Congo; also at other points in the Congo region. Lacroix, C. R., **114**, 1384, 1892. See also A. Le Chatelier, C. R., **116**, 894, 1893.

Etching-figures investigated, Traube, Jb. Min., Beil.-Bd., **10**, 462, 1896.

**DIPYRE.**—See *Wernerite.*

**DOLOMITE**, pp. 271, 1033.—From Raibl, containing traces of thallium and lithium, Heberdey, Zs. Kr., **21**, 71, 1892.

Origin discussed, Klement, Min. petr. Mitth., **14**, 526, 1895; Pfaff, Jb. Min., Beil.-Bd., **9**, 485, 1894.

The black crystals from Teruel, Spain, occurring embedded in gypsum have been long called *teruelite.*

**DUFRENOYSITE**, p. 120.—Description by Baumhauer of crystals (anal., König) with the new forms (223), (441), (207), (103), (205), (407), (027), (013), (025), (049), (047), Zs. Kr., **24**, 85, 1894; **28**, 551, 1897.

**Dundasite.** *W. F. Petterd*, Catalogue of Minerals of Tasmania, p. 26, 1893. Inferred from qualitative tests to be a hydrated carbono-phosphate of lead and aluminium. Occurs as an incrustation on a ferro-manganese gossan with crocoite; consists of small spherical aggregates with radiated structure; color within white and silky, externally yellow-brown. H. = 2. From the Adelaide Proprietory mine, Dundas, Tasmania.

**DURDENITE**, p. 980.—F. C. Knight has noted an oxidation-product of the tellurides of Cripple Creek, Colo. The soluble (HCl) portion of the mixture analyzed was perhaps $2\mathrm{Fe_2O_3.2TeO_3.H_2O}$, the insoluble calaverite. Proc. Colo. Soc., Oct. 1, 1894.
]

**DYSCRASITE**, p. 42.—Crystals from the Harz described, Luedecke, Min. d. Harzes, 48, 1896.

**EDINGTONITE**, p. 599.—Occurs in large crystals (to 3 cm. in length) at the mines of Böhl, Sweden. Habit prismatic, tabular ‖ one pair of *m*-faces; twins, pseudo-tetragonal. These are referred to the orthorhombic system (hemihedral) with the forms: *c* (001), *m* (110), *p* (111), *p*, (1$\bar{1}$1), *r*, (121), *r*, (1$\bar{2}$1). Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·9873 : 1 : 0·6733. Angles: *mm'''* = 89° 16′, *cp* = 43° 47′. G. = 2·776. $2E_y$ = 87° 17′. O. Nordenskiöld. Bull. Soc. Min., **18**, 396, 1895, and G. För. Förh., **17**, 597, 1895. An analysis is given by G. Lindström, Öfv. Ak. Stockh., **53**, 469, 1896.

**Elfstorpite.** *L. J. Igelström*, G. För. Förh., **15**, 472, 1893; Zs. Kr., **22**, 468. An imperfectly described mineral from the Sjö mine, Orebro, Sweden. Occurs in crystals and crystalline particles with one cleavage. H. = 4. Brittle. Color and streak whitish gray. Inferred, on the basis of a partial qualitative analysis, to be a hydrated arsenate of manganese (MnO).

**Elpidite.** G. Lindström, G. För. Förh., **16**, 330, 1894. *G. Nordenskiöld, ibid.*, p. 343.

Orthorhombic. Axes: $\breve{a} : \bar{b} : \dot{c}$ = 0·5117 : 1 : 0·9781. 100 ∧ 110 = 27° 6′, 001 ∧ 101 = 62° 28′, 001 ∧ 011 = 44° 22′. Forms *a* (100), *b* (010), *c* (001), *m* (110), *n* (120), *e* (013), *d* (011); also doubtful *u* (540), *t* (580), *s* (5·12·0). Angles: *mm'''* = *54° 12′, *cd* = *44° 22′. Crystals prismatic, rarely distinct (described by G. Nordenskiöld). Usually massive, fine fibrous or columnar; also as a felt-like mass.

Cleavage: *m* (110). H. nearly 7. G. = 2·524 white, 2·594 red. Luster silky. Color white to brick-red. Extinction parallel to prismatic direction, which corresponds to *a*.

Composition, essentially, $H_6Na_2ZrSi_6O_{18}$ or $Na_2O.ZrO_2.6SiO_2.3H_2O$. Analysis, Lindström:

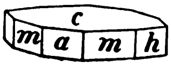
| $SiO_2$ | $ZrO_2$ | FeO | CaO | $Na_2O$ | $K_2O$ | $H_2O$ (ign.) | $H_2O$ (100°) | Cl | |
|---|---|---|---|---|---|---|---|---|---|
| 59·44 | 20·48 | 0·14 | 0·17 | 10·41* | 0·13 | 5·72 | 3·89 | 0·15 | $TiO_2$,CuO *tr.* = 100·53. |

*Another determination gave: $Na_2O$ 10·29, $K_2O$ 0·21.

From the locality in southern Greenland (probably Nagssarsuk near Igaliko) which has afforded neptunite (see this App., p. 49) and epididymite, p. 25. Named from ἐλπις, hope.

**ENARGITE**, pp. 147, 1033.—Occurs at the Ida mine, also at Red Mountain, Summit distr., Colorado; crystals from the latter locality show the new forms *v* (210), *e* (012), *s* (134); habit prismatic or tabular (figs. 1–5, Red Mountain). Pirsson, Am. J. Sc., **47**, 212, 1894.

1.



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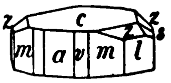

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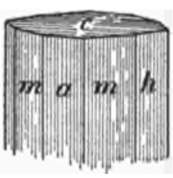

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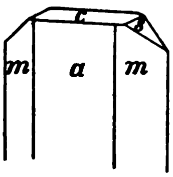
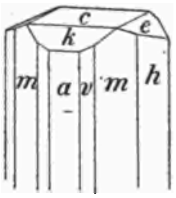


5.



Monograph on the crystallization, L. J. Spencer; new forms noted are: *y* (610), *f* (520), *i* (540), *N* (230), *t* (108), *A* (207), *w* (709), *u* (301). The author concludes that clarite (Min., p. 148) is identical with enargite. Min. Mag., **11**, 69, 1895. Crystals from Peru show the new forms *π* (031), *φ* (132), $\phi_1$ (394), $\phi_2$ (131), $\phi_3$ (392), *idem*, Min. Mag., **11**, 196, 1897.

Occurs in large crystals at the Bell Stow mine, Missoula Co., Montana, Moses, School Mines Q., **16**, 230, 1895. Analysis, from Butte, Montana, Hillebrand, Am. J. Sc., **7**, 56, 1899.

**ENSTATITE**, p. 346.—From Corundum Hill, N. C., also Webster, Jackson Co., N. C., analyses quoted by Pratt, Am. J. Sc., **5**, 430, 431, 1898.

Investigation of alteration-products, Johansson, Ak. H. Stockh., Bihang, **17** (2), No. 4, 1891. (Ref. in Zs. Kr., **23**, 152.)

**Epididymite.** *G. Flink*, G. För. Förh., **15**, 201, 1893; Zs. Kr., **23**, 353, 1894. *G. Nordenskiöld*, G. För. Förh., **16**, 345, 1894.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·5758 : 1 : 0·5340 or 1 : 1·7367 : 0·9274. 100 ∧ 110 = 29° 56′, 001 ∧ 101 = 42° 50½′, 001 ∧ 011 = 28° 6¾′. Observed forms: *a* (100), *b* (010), *c* (001); *m* (110), *l* (120), *n* (130); *i* (023), *h* (034), *g* (011), *e* (043), *d* (021), *f* (041), *λ* (061), *χ* (081); *p* (221). Angles: *mm'''* = 59° 52′, *nn'* = 119° 52′, *bn* = *30° 4′, *cd* = *46° 53′.

Crystals usually tabular ‖ *c* and elongated by extension of the faces in the brachydome zone; these faces horizontally striated. In part in hexagonal tables, *b* and *m* being equally developed; these also twinned, having *c* in common but revolved 60° about the vertical axis, and as tw. lamellæ.

Cleavage: *b* and *c* perfect. H. = 5·5. G. = 3·548. Luster vitreous, on *b* and *c* pearly.

Colorless. Optically —. Ax. pl ǀ *c*. $Bx_a \perp b$. Indices: For Na, $\alpha = 1·5645$, $\beta = 1·5685$, $\gamma = 1·5688$. ∴ $2V_{a,y} = 31° 4'$.

Composition $HNaBeSi_3O_8$ like eudidymite (Min., p. 318). Analysis, G. Flink:

| $SiO_2$ | BeO | $Na_2O$ | $H_2O$ |
|---|---|---|---|
| 73·74 | 10·56 | 12·88 | 3·73 = 100·91 |

B.B. fuses easily to a colorless glass, but yields water only at a high temperature. Not attacked by acids.

From Greenland, exact locality uncertain, probably Narsasik (or Nagssarsuk, Lindström) near Igaliko, cf. *neptunite* and *elpidite*.

Epidote, p. 516.—Crystals from Quenast described, Stöber, Bull. Ac. Belg., **29**, 403, 1895. Also from the Comba di Compare Robert, Avigliana, G. Boeris, Atti Accad. Sc. Torino, **32**, April 25, 1897, and Riv. Min. Ital., **20**, 65, 1898.

Optical examination of isomorphous layers of crystals, Ramsay, Jb. Min., **1**, 111, 1893.

Occurrence as a primary constituent of igneous rocks, Keyes, Bull. G. Soc. Amer., **4**, 305, 1893.

The relation of epidote to zoisite is discussed by Weinschenk, Zs. Kr., **26**, 166, 1896. See also *Clinozoisite*.

Epsomite, p. 938.—Description of natural crystals from Stassfurt (new form *g* (210)), also optical determination, Milch, Zs. Kr., **20**, 221, 1892.

**Erionite.** *A. S. Eakle*, Am. J. Sc., **6**, 66, 1898, and Zs. Kr., **30**, 176, 1898.

Orthorhombic. In aggregates of very slender fibers, resembling woolly hairs. G. = 1·997. Luster pearly. Color white. Optically biaxial, positive. Extinction and $Bx_a$ (c) parallel to fibers. Birefringence high.

Composition, $H_2CaK_2Na_2Al_2Si_6O_{17} + 5H_2O$ or $CaO.K_2O.Na_2O.Al_2O_3.6SiO_2.6H_2O$. Analysis:

| $SiO_2$ | $Al_2O_3$ | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|
| 57·16 | 16·08 | 3·50 | 0·60 | 3·51 | 2·47 | 17·30 = 100·68 |

Fuses B.B. easily and quietly to a clear, colorless glass. Easily soluble in hydrochloric acid.

Occurs with milky opal in cavities in a rhyolite tuff at Durkee, Oregon. Named from ἔριον, wool.

Erythrite, p. 817.—Occurs on the west shore of Rabbit Lake, Nipissing, Ontario, Ferrier, Ottawa Naturalist, **9**, 198.

Ettringite, p. 976.—From Tombstone, Arizona, analyzed by Moses (after deducting 1·91, $SiO_2$): $SO_3$ 18·54, $Al_2O_3$ 9·72, CaO 26·31, $H_2O$ (red heat) 10·88, $H_2O$ (115°) 34·53 = 99·98. Formula deduced $10CaO.2Al_2O_3.5SO_3.54H_2O$; 14 parts of $H_2O$ go off at a red heat, the formula then reduces to $2R_2O_3.SO_3 + 8H_2O$. Occurs in bunches of white, silky fibers. H. = 2. G. = 1·55. Shows double refraction with parallel extinction. Am. J. Sc., **45**, 489, 1893; Zs. Kr., **22**, 16, 1893.

**Euchlorine.** *A. Scacchi*, 1869; *E. Scacchi*, Rend. Accad. Napoli, **23**, 158, 1884. A thin emerald-green incrustation on the lava at Vesuvius. The analysis by Pisani (quoted by Scacchi) made it a compound of copper sulphate and cuprous chloride. According to a later investigation, however (E. Scacchi), it is made up of an insoluble and a soluble portion. The proper euchlorine yielded: $SO_3$ 43·98, CuO 41·50, $K_2O$ 8·04, $Na_2O$ 6·48 = 100. The crystallization is orthorhombic. Observed forms: *b* (010), *c* (001), *e* (011), *d* (103), *o* (101); measured angles: *ce* = 61° 56′, *co* = 67° 54′. An analysis by Rammelsberg (Min. Ch., Erg.-Heft, 87, 1886) gave: $SO_3$ 42·96, CuO 37·87, $Na_2O$ 5·48, $K_2O$ 10·34, $H_2O$ [3·35] = 100.

Euchroite, p. 838.—Libethen, crystals with the new forms, *f* (102), *d* (101), Gissinger, Zs. Kr., **22**, 367, 1892. An analysis by A. H. Church shows 1·48 p. c. $P_2O_5$, Min. Mag., **11**, 1, 1895.

Euclase, p. 508.—Bahia, Brazil, crystals described, Hussak, Min. petr. Mitth., **12**, 473, 1892.

Eudialite, pp. 409, 1034.—Kola peninsula, optical investigation of crystals, confirming and extending earlier results (Min., p. 410), Ramsay, Jb. Min., Beil.-Bd., **8**, 722, 1893.

Evansite, p. 846.—Occurs at a mine in the Zeehan district, Tasmania. G. = 1·939. Analysis: $P_2O_5$ 18·11, $Al_2O_3$ 40·19, $H_2O$ = 41·27 = 99·57. H. G. Smith, Proc. R. Soc. N. S. W., **27**, 382, 1893.

**FAYALITE**, pp. 456, 1034.—From Rockport, Mass., analysis (nearly pure $Fe_2SiO_4$, G. = 4·318) and optical properties with discussion of the relation of the latter to composition in the species of the Chrysolite Group; also analysis of hortonolite. Penfield and Forbes, Am. J. Sc., 1, 129, 1896. Analysis of crystals from slag, G. O. Smith, Johns Hopkins Univ. Circ., 112, May 1894.
See also *Neochrysolite* and *Breislakite*.

**Fedorovite.** Fedorowit, *C. Viola*, Jb. Min., 1, 121, 1899.—See *Pyroxene*.

**FELDSPARS**, pp. 314, 1034.—Much work has been done recently upon the optical characters of the feldspars, and chiefly those of the plagioclase series; this has to a large extent had as its object the determination of the different species under the microscope, as, for example, in the form they appear in thin-sections of rocks. Prominent contributions are the following:

Michel-Lévy, an important work entitled "Étude sur la détermination des feldspaths dans les plaques minces," Paris (two parts), 1894 and 1896 (see Bull. Soc. Min., 18, 79, 1895). A summary of this (and other papers) is given by N. H. Winchell in Amer. Geol., 21, 12, 1898; see also G. F. Becker, Am. J. Sc., 5, 349, 1898.

Fedorow, feldspar studies, Zs. Kr., 22, 248, 1893; 26, 225, 1896; 27, 337, 1896; 29, 604, 1898. Viola, Zs. Kr., 30, 23, 232, 1898.

Fr. Becke, determination of refractive indices, Ber. Ak. Wien, 102 (1), 358, 1893; also determination by interference-figures, etc., Min. petr. Mitth., 14, 415, 1895.

Bertrand, Bull. Soc. Min., 20, 219, 1897. Wallerant, rapid determination in rocks, *ibid.*, 21, 268, 1898.

Many optical determinations with analyses are given by Fouqué, Bull. Soc. Min., 17, 283–611, 1894. See also Brögger, Eruptivgesteine d. Kristianiagebietes, 1894–98; also many memoirs on petrography (Jb. Min., Min. petr. Mitth., *et al.*).

Discussion of composition of plagioclase feldspars, Rammelsberg, Jb. Min., 2, 165, 1896.

See also the species *Albite*, *Anorthite*, *Anorthoclase*, *Celsian*, *Microcline*, *Orthoclase*.

**FERGUSONITE**, p. 729.—From Ceylon, analysis, Prior, Min. Mag., 10, 234, 1893.
Examination of gases yielded (helium, etc.), Ramsay, Proc. Roy. Soc., 59, 325, 1896; Ramsay and Travers, *ib.*, 60, 443, 1897. Investigation of endothermic properties, Ramsay, *ib.*, 62, 325, 1898.

**FIEDLERITE**, p. 172.—Description of crystals from Laurion, Greece, Lacroix, C. R., 123, 955, 1896. Also G. F. Herbert Smith, Min. Mag., 12, 107, 1899.

**FLUOCERITE**, pp. 175, 1034.—Weibull has described a fragment of an hexagonal crystal from Österby (cf. anal., Min., p. 175) with *m* ($10\bar{1}0$) and *p* ($11\bar{2}2$); $mp = 51°$, whence $a : \dot{c} = 1 : 1·06$. Optically uniaxial, positive; $\epsilon - \omega = 0·002$ approx. G. För. Förh., 20, 54, 1898.

**Fluor-adelite.**—See *Tilasite*.

**FLUORITE**, pp. 161, 1034.—Sarnthal, Tyrol, crystals described with the form (27·12·5) developed by corrosion, Höfer, Min. petr. Mitth., 12, 500, 1892. On crystals from the Harz Mts., Luedecke, Min. d. Harzes, 252, 1896.

Tenacity investigated, Sella and Voigt, Wied. Ann., 48, 663, 1893.

Anomalous optical characters, Wallerant, Bull. Soc. Min., 21, 44, 1898.

Phosphorescent under the action of X-rays, this is also true of calcite and other species, Burbank, Am. J. Sc., 5, 53, 1898.

Refractive indices for long waves, Carvallo, C. R., 116, 1189, 1893; Rubens and Snow, Wied. Ann., 46, 529, 1892.

Dispersion in the infra-red, Paschen, Wied. Ann., 53, 301, 1894.

Photoelectrical properties, Schmidt, Wied. Ann., 62, 407, 1897.

From Quincié, containing free fluorine (anal., G. = 3·117), to which the odor on fracture is due, Becquerel and Moissan, Bull. Soc. Chim., 5, 154, 1891.

On the fluorite deposits of southern Illinois, see S. F. Emmons, Trans. Am. Inst. Mng. Eng., 21, 31, 1892.

Occurs on a large scale at San Roque, Cordoba, Argentina, Valentin, Zs. prakt. Geol., 4, 104, 1896.

**Folgerite.** *S. H. Emmens*, J. Am. Chem. Soc., 14, No. 1, 1892.—See *Pentlandite*.

**FOSTERITE**, p. 450.—Colorless transparent crystals from Monte Somma have been measured by Jolles and analyzed by Thaddéeff, see Arzruni (Zs. Kr., 25, 471, 1895); the latter also gives the optic-axial angles and notes twins with (031) as tw. pl.

Analysis, from the crystalline limestone of the Passau graphite region, Weinschenk, Zs. Kr., 28, 145, 1897.

**Franckeite.** *A. W. Stelzner*, Jb. Min., 2, 114, 1893.
Massive, with imperfect radiated and foliated structure; in part in spherules aggregated in

reniform shape. Cleavage perfect in one direction. Somewhat malleable, making a mark on paper. H = 2·75. G. = 5·55. Luster metallic. Color blackish gray to black. Opaque.

Composition, $Pb_5Sn_2Sb_2S_{12}$ or $2PbSnS_3.Pb_3Sb_2S_6$. Analysis by C. Winkler:

| S | Sb | Sn | Pb | Fe | Zn | Gangue |
|---|---|---|---|---|---|---|
| 21·04 | 10·51 | 12·34 | 50·57 | 2·48 | 1·22 | 0·71 = 98·87 |

Germanium is present in small amount (0·1 p. c.); also about 1 p. c. silver.

B.B. on charcoal gives a yellow coating of lead oxide, and farther from the assay one of oxide of antimony. In the open tube yields sulphurous and antimonial fumes. In the closed tube, a slight coating of germanium sulphide if no air is present. Dissolved by nitric acid with the separation of a white powder (oxides of antimony, tin and germanium); also readily in aqua regia with separation of sulphur.

From the silver-mining region of Las Animas, southeast of Chocaya, Bolivia; it is locally known as *llicteria;* wurtzite is closely associated. Named after the mining engineers, Carl and Ernst Francke.

**Friedelite**, pp. 465, 1035.—From the Sjö mine, Wermland, Sweden, analysis, Igelström: $SiO_2$ 34·36, MnO 45·88, FeO 1·35, CaO 1·50, MgO 1·50, Mn 2·79, Cl 3·00, $H_2O$ 9·00, $P_2O_5$ *tr.* = 99·38. G. För. Förh., **14**, 505, 1892; Zs. Kr., **21**, 92, 1892.

**Fuggerite.** *E. Weinschenk*, Zs. Kr., **27**, 577, 1896.

In thick four-sided tabular crystals, probably tetragonal. Cleavage: basal, perfect. H. = 6·5. G. = 3·18. Color light apple-green; also white and dull. Birefringence very low, for yellow (Na) sensibly isotropic; $\omega_{na} = \epsilon_{na} = 1·691$.

Corresponds in composition to a member of the gehlenite-åkermanite series (3 Åk : 10 Gehl), but deviates in physical characters. Analysis, E. Mayr:

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | $Na_2O$ | MnO,$K_2O$ | insol. |
|---|---|---|---|---|---|---|---|
| 34·04 | 17·97 | 3·49 | 37·65 | 4·89 | 2·04 | *tr.* | 0·12 = 100·20 |

Occurs on the contact-zone adjoining the monzonite of the Monzonithal; in part as a microscopic constituent, in part in nests of crystals, also as a coarse-granular aggregate with calcite.

**Gadolinite**, pp. 509, 1035.—Crystals from the Harz described by Luedecke, Min. d. Harzes, 438, 1896.

**Gahnite**, pp. 223, 1035.—Occurs in Raglan township, Renfrew Co., Ontario, Hoffmann, Rep. G. Canada, **9**, 15R, 1896.

**Galena**, p. 48.—Cryst.—From Neudorf with the new form (551), Cesàro, Zs. Kr., **20**, 468, 1893. From the Harz, Luedecke, Min. d. Harzes, 16, 1896. On the octahedral cleavage of a variety from Nil-St.-Vincent containing tellurium, Cesàro, Ann. Soc. G. Belg., **19**, Bull., 76, 1892. Freiberg, new form (447), Cesàro, Ann. Soc. G. Belg., **24**, lxxix, 1898.

From Broken Hill, N. S. W., containing 15·5 p. c. Zn, Liversidge, Proc. Roy. Soc., N. S. W., **29**, 320, 1895. Cubic crystals stated to be from Bingham, Utah, gave Hartley 4·97 p. c. Zn, Miers, Min. Mag., **12**, 112, 1899.

**Garnet**, pp. 437, 1035.—Pyrope of cubic form occurs in the diamond sands of Agua Suja, Minas Geraes, Brazil, Hussak, Ann. Mus. Wien, **6**, 113 (not.), 1891.

Optical investigation of crystals from many localities with references to the recent literature (since 1882, cf. Min., p. 439), etc., Klein, Jb. Min., **2**, 68, 1895, also Ber. Ak. Berlin, 723, 1895; 676, 1898. See also Brauns, Opt. Anom., 1891, p. 183; Karnojitsky, Vh. Min. Ges., **34**, 1, 1896; Fedorow, Zs. Kr., **28**, 276, 1897.

Optical character of *pyrenéite* corresponding to that of an orthorhombic crystal, Mallard, Bull. Soc. Min., **14**, 293, 1891. Same of *melanite* from Algeria, Gentil, Bull. Soc. Min., **17**, 269, 1894; of crystals from Affaccata, Elba, G. D'Achiardi, Annal. Univ. Tosc., **20**, 1896.

*Grossularite*, analysis of an apple-green variety resembling jade, found as a water-worn pebble near Eltoro, California, F. W. Clarke, Am. J. Sc., **50**, 76, 1895. Analyses, Rothenkopf, Zillerthal, Schnerr, Zs. Kr., **27**, 431, 1896.

*Almandite*, analysis, Sydney, N. S. W., H. G. Smith, Proc. Roy. Soc., N. S. W., **28**, 47, 1894.

*Andradite* from nephelite-syenite of Dungannon, Hastings Co., Ont., with 1·08 p. c. $TiO_2$, Adams and Harrington, Am. J. Sc., **1**, 217, 1896. Italian Peak, Gunnison Co., Colo., Eakins, Bull. U. S. G. Surv., **113**, 112, 1893.

*Topazolite*, *Melanite*, analyses, Piners, Zs. Kr., **22**, 479, 1894.

*Pyrope*, etc., chemical composition discussed with analysis, C. v. John, Jb. G. Reichs., **42**, 53, 1892.

*Spessartite*, analyses from Llano Co., Texas, W. H. Melville, Bull. U. S. G. Surv., **90**, 40, 1892. Silberberg near Bodenmais, analysis, Weinschenk, Zs. Kr., **25**, 357, 1895. Aschaffenburg (analysis by Wehr and Schröder), Weinschenk, Zs. Kr., **28**, 162, 1897. Caprera, Sardinia, Lovisato, Rend. Accad. Linc., **5** (1), 56, 1896.

Analyses by Wait of varieties from Canada. Hoffmann, Rep. G. Canada, **6**, 16R, 1892–93.

Discussion of composition with analyses, K. H. Schnerr, Inaug. Diss. Munich, 1894, abstract in Jb. Min., **1**, 482 ref., 1897.

Occurrence in the dune sands of Holland (analysis), Retgers, Jb. Min., **1**, 16, 1895.

Discussion of relation of subspecies, Weinschenk, Zs. Kr., **25**, 365, 1895.

Hrubschitz, altered to diopside, hornblende, and plagioclase, Barvíř, Ber. Böhm. Ges., May 19, 1893.

Artificial formation of *melanite*, Michel, C. R., **115**, 830, 1892.

*Rhodolite* is a variety from Mason's Branch, Macon Co., N. C., described by Hidden and Pratt (Am. J. Sc., **5**, 294, 1898). Characterized by its rose-like color and brilliant luster by reflected light. Occurs in rolled pieces and etched fragments. G. = 3·838. Composition corresponds to 2 molecules of pyrope, $Mg_3Al_2[SiO_4]_3$, and 1 of almandite, $Fe_3Al_2[SiO_4]_3$. Analysis, Pratt:

| | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MgO | CaO |
|---|---|---|---|---|---|---|
| (½) | 41·59 | 23·13 | 1·90 | 15·55 | 17·23 | 0·92 = 100·32 |

*Lagoriolite* (Lagoriolith) is an artificial compound obtained by Morozewicz, corresponding in composition to a soda-variety of grossular garnet; formula $(Na_2,Ca)_3Al_2[SiO_4]_3$, with $Na_2$ : Ca = 3 : 2. An analysis (deducting 14·8 p. c. insol.) gave: $SiO_2$ 39·6, $Al_2O_3$ 21·4, CaO 14·2, $Na_2O$ 23·6, $SO_3$ 1·2 = 100. The crystals obtained seemed to be isometric in form (100 and 110), but showed optical anomalies, twinning, etc., analogous to some garnet, also particularly to noselite and haüynite. Named after Professor A. Lagorio. Min. petr. Mitth., **18**, 147, 1898.

*Schneebergite* of Brezina is shown by Eakle and Muthmann to be a garnet of the topazolite type in octahedral form. Am. J. Sc., **50**, 244, 1895; Zs. Kr., **24**, 583, 1895.

*Ransätite* is a supposed new mineral from the damourite of Bliaberg, Ransät, Wermland, Sweden, described by Igelström (G. För. Förh., **18**, 41, 1896). It is shown by Weibull (*ibid.*, **20**, 53, 1898) to be an impure manganesian garnet.

**Garnierite**, p. 676.—N. Caledonia, analysis of a related silicate, Pisani, Bull. Soc. Min., **15**, 48, 1892. Various nickel silicates have been examined by H. v. Foullon, Jb. G. Reichs., **42**, 223, 1892.

**Gay-Lussite**, p. 801.—Crystals described from Borax Lake, San Bernardino Co., Cal. (Figs. 1–3). G. = 1·992. J. H. Pratt, Am. J. Sc., **2**, 130, 1896.

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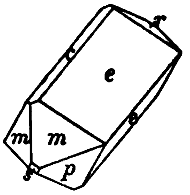

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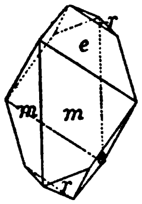

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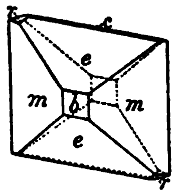

Occurs in a confused crystalline mass at the borax locality in San Bernardino Co., Cal., Hanks, Am. J. Sc., **43**, 540, 1892, Mng. Sc. Press, March 26, 1892.

On the artificial formation, A. de Schulten, C. R., **123**, 1023, 1896.

**Gehlenite**, p. 476.—Occurs in limestone of the Kaiserstuhl, Brauns, Jb. Min., **1**, 81, 1899. See also *Fuggerite*.

**Geikielite.** *L. Fletcher*, Nature, **46**, 620, Oct. 27, 1892. *A. Dick*, Min. Mag., **10**, 145, 1893.

Massive; in rolled pebbles. Cleavage: in one direction perfect; also imperfect in another, nearly normal to it. Brittle. H. = 6. G. = 3·98–4. Luster metallic-adamantine on the cleavage-face. Color bluish or brownish black; microscopic fragments transmit a purplish-red light. Optically uniaxial, negative. Birefringence high.

Composition, essentially magnesium titanite, $MgTiO_3$. Analysis, Dick:

$TiO_2$ 67·74 MgO 28·73 FeO 3·71 = 100·38

B.B. infusible; reacts for titanium with salt of phosphorus. Slowly decomposed by hot hydrochloric acid if in fine powder.

Obtained from the gem mines of Rakwana, Ceylon, a locality which has also furnished baddeleyite. Named after Sir Archibald Geikie, Director of the Geological Survey of Great Britain.

**Gersbyite.** *L. J. Igelström*, Zs. Kr., **28**, 310, 1897. Occurs in pale-blue to deep-blue grains embedded in quartzose damourite-schist at Dicksberg, Wermland, Sweden. Closely resembles lazulite and is near it in composition. One of several analyses gave: $P_2O_5$ 32·26, $Al_2O_3$ 46·68, CaO,FeO,MnO 6·66, MgO 5·33, $H_2O$ 9·07 = 100.

Gersdorffite, p. 90.—Occurs in octahedral crystals in Denison township, Algoma district, Ontario (analysis by Johnston), Hoffmann, Rep. G. Canada, 5, 22R. Also on Kootenay Mountain, near Rossland, British Columbia, *ibid.*, 9, 15R, 1896. Analysis from Goslar in the Harz, Klockmann, Zs. prakt. Geol., 1, 387, 1893.

Gibbsite, p. 254.—Artificial formation of crystals, A. de Schulten, Bull. Soc. Min., 19, 157, 1896.

Gilsonite.—See *Uintaite.*

Gismondite, p. 586.—Occurrence in basalt, St.-Agrève, Ardèche, France, Gonnard, C. R., 117, 590, 1893.

Glauberite, p. 898.—Description and measurements of crystals from Westeregeln, W. von Schulz, Vh. Min. Ges., 30, 75, 1893.

**Glaucochroite.** *S. L. Penfield* and *C. H. Warren*, priv. contr.

Orthorhombic. In embedded prismatic crystals without distinct terminations. Prismatic angle $m \wedge m$ 47° 30′. Twins with the brachydome (011) as tw. plane, the vertical axes crossing at an angle of 58°30′ (microscope). Axes $\breve{a} : \bar{b} : \dot{c} = 0·44 : 1 : 0·56$. H. about 6. G. = 3·407. Color a delicate bluish-green like some beryl.

Composition, $CaMnSiO_4$, analogous to the Chrysolite Group; corresponds to a manganese monticellite. Analysis, Warren:

| $SiO_2$ | MnO | CaO | PbO |
|---|---|---|---|
| 31·48 | 38·00 | 28·95 | 1·74 = 100·17 |

B.B fuses quietly at 3·5. Easily soluble in hydrochloric acid and yields gelatinous silica upon evaporation. Reacts for manganese with borax.

Occurs at Franklin Furnace, N. J., with nasonite, brown garnet, axinite and a little franklinite. Named from γλαυκός, *blue-green*, and χροα, *color*, in allusion to its color.

Glauconite, p. 683.—Extensive beds occur in Spottsylvania and Stafford Cos., Va., analysis, Corse and Baskerville, Am. Ch. J., 14, 627, 1892.

In Woodburn, Antrim, Ireland, analysis, Hoskins, Geol. Mag., 2, 317, 1895.

General discussion of composition, origin, etc., Gümbel, Ber. Ak. München, 26, 545, 1896; also Glinka, Zs. Kr., 30, 390, 1898.

Glaucophane, p. 399.—Investigation of etching-figures, R. A. Daly, Proc. Am. Acad. Sc., 34, 404, 1899.

Analysis, Beaume, Dora Riparia, Colomba, Att. Accad. Torino, 29, 404, 1893.

*Rhodusite* is a variety of glaucophane described by Foullon as occurring in the Eocene Flysch rocks of the island Rhodus. It is characterized by a fibrous asbestus-like structure. Color lavender-blue. Analysis of purified material gave:

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MgO | CaO | $Na_2O$ | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|
| 55·03 | 0·49 | 15·47 | 7·39 | 11·48 | 0·98 | 6·38 | 0·80 | 1·98 = 100 |

This corresponds to a glaucophane, in which $Fe_2O_3$ has taken the place of $Al_2O_3$. Ber. Ak. Wien, 100 (1), 176, 1891

See also *Crossite.*

Glockerite, p. 970.—An orange-yellow ocherous basic ferric sulphate from Parys Mount, Anglesea, analyzed by Church, corresponds nearly to $2Fe_2O_3.SO_3.8H_2O$. Loss of $H_2O$ at 100° 18·51 p. c., on moderate ignition 12·85. Glockerite is $2Fe_2O_3.SO_3.6H_2O$. Min. Mag., 11, 13, 1895.

Gmelinite, p. 593.—Crystals from Montecchio Maggiore, described with new forms (21$\bar{3}$0), (21$\bar{3}$3), (12$\bar{3}$3), Artini, Giorn. Min., 2, 262, 1891.

Gold, p. 14.—Crystals from the Ural, described, new form (811), Jeremejev, Vh. Min. Ges., Prot., 33, 60, 1895.

Crystalline structure of nuggets investigated by Liversidge, Proc. R. Soc. N. S. W., 31, 70, 1897 (read Oct. 3, 1894). Discussion as to the origin of moss gold and of gold nuggets, Liversidge, Proc. R. Soc. N. S. W., 27, 287, 303, Sept. 6, 1893.

Gold containing palladium occurs in the Caucasus, Th. Wilm, Zs. anorg. Chem., 4, 300, 1893.

Occurs in California with albite, barite, calcite, etc., Turner, Am. J. Sc., 47, 467, 1894.

On the gold fields of the Southern Appalachians, G. F. Becker, 16th Ann. Rept. U. S. G. Surv., Part II, 1894. Of Transvaal, the same, 18th Ann. Rept. U. S. G. Surv., Part V, 1896. Of Alaska, the same, 18th Ann. Rept. U. S. G. Surv., Part III (also Map of Alaska, etc., S. F. Emmons, U. S. G. Surv., 1898). Of Georgia, Geol. Surv. Georgia, Bulletin 4A, Yeates, McCallie and King, 1896. On the mining region of Cripple Creek, Colorado, Cross and Penrose, 16th Ann. Rept. U. S. G. Surv., Part II.

The world's production of gold has increased at a very remarkable rate during the past decade. In 1890 the value of the total amount produced (see Min., p. 19) was less than 120 million dollars; in 1896 it was about 200 millions, in 1897 237 millions, and the amount estimated for 1898 is upwards of 280 millions. Of this increase, South Africa has contributed relatively the largest amount. For the United States the amount for 1898 is nearly 66 millions, or double that of 1890; for Colorado the amount has increased from 4 millions in 1890 to more than 24 millions for 1898, chiefly through the productivity of the Cripple Creek mines. Canada's amount for 1898 is 14½ millions, of which it is estimated that the Klondike region on the tributaries of the Yukon river has yielded 12 millions.

**Goldschmidtite.** *W. H. Hobbs*, Am. J. Sc., **7**, 357, 1899.

Monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1{\cdot}8561 : 1 : 1{\cdot}2980$; $\beta = 89° 11' = 100 \wedge 001$. Forms *a* (100), *b* (010), *c* (001); *g* (310), *f* (210), *m* (110), *t* (370), *l* (130); *y* (508), *s* (101), *n* (201), *r* (703), *w* (401), *q* (801), *x* (10·0·1), *v* (35·0·1), *S* ($\bar{1}$01), *N* ($\bar{2}$01), *W* ($\bar{4}$01), *X* ($\overline{10}$·0·1), *Z* ($\overline{14}$·0·1); *k* (032). Angles: $am = {}^*61° 41'$, $mm''' = 123° 22'$, $as = 54° 29'$, $a'S = {}^*55° 35'$, $an = 35° 17'$, $a'N = 35° 50'$, $ac = 89° 11'$ (mean derived (following Hobbs) from the measured angles: $as = 54° 57'$, $a'S = 55° 35'$ and $an = 34° 13'$, $a'N = 34° 58$). In form related to calaverite).

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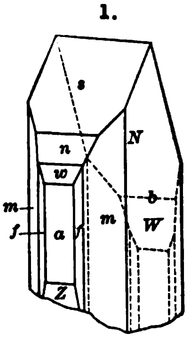

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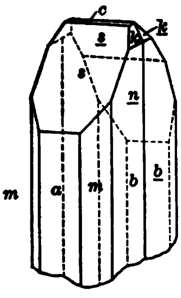

Crystals prismatic ‖ $\dot{c}$. Twins common, tw. plane *a* (100) (Fig. 2).

Cleavage, *b* (010) perfect. Brittle. H. = 2. G. = 8·6 (estimated). Luster metallic. Color silver-white. Streak dull grayish black. Opaque.

Composition, $Au_2AgTe_6$. Analysis (on 0·1 gram):

Te [59·64] Au 31·41 Ag 8·95 = 100

B.B. fuses easily on charcoal, giving a bluish-green flame (Te) and yielding a white sublimate of tellurium oxide with a yellowish-white button of gold and silver.

Occurs sparingly at the Gold Dollar mine in Arequa Gulch, Cripple Creek district, Colorado. Named after Professor Victor Goldschmidt of Heidelberg.

See also *Calaverite* and *Krennerite*.

**Gonnardite.** *A. Lacroix*, Bull. Soc. Min., **19**, 426, 1896. Min. France, **2**, 279, 1896.

Orthorhombic? In spherules with fibrous structure. H. = 4·5–5. G. = 2·246–2·26; 2·357 Gonnard. Color white. Luster silky. Translucent. Optically biaxial, positive. $Bx_a$ and ax. pl. parallel to the fibers. Ax. angle very small.

Composition, $(Ca,Na_2)_3Al_2Si_5O_{15} + 5\frac{1}{2}H_2O$ with $Ca : Na_2 = 5 : 3$. Analysis, Pisani, quoted by F. Gonnard, C. R., **73**, 1448, 1871:

| $SiO_2$ | $Al_2O_3$ | CaO | $Na_2O$ | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|
| 42·3 | 28·1 | 10·0 | 6·7 | *tr.* | 14·1 = 101·2 |

From cavities in the doloritic basalt of Gignat, Puy-de-Dôme and elsewhere in the same region; early analyzed by Pisani, l. c.; in Dana's Min. (p. 606) provisionally referred to mesolite. Named after M. Gonnard of Lyons, France.

**GOSLARITE**, p. 939.—Occurs in white silky fibrous masses at Altenberg (anal.). Gräff, Jb. Min., **1**, 76, 1899.

**GÖTHITE**, pp. 247, 1036.—Optical investigation of crystals from Ouro Preto, Brazil, giving results differing from those of Palla. Ax. pl. ‖ *a* (100) for red, ‖ (001) for green (and yellow); optically negative for both colors. $2E_r = 58° 31'$, $2E_{gr} = 67° 42'$. $\beta = 2{\cdot}5$. Pelikan, Min. petr. Mitth., **14**, 1, 1894.

The ocherous variety abundant at Mesabi, Minnesota, has been called *mesabite* by H. V. Winchell, Trans. Am. Inst. Mng. Eng., **21**, 661, 1898.

**GRAHAMITE**, p. 1020.—A related mineral substance occurs at various points in Texas, cf. Dumble, Trans. Amer. Inst. Mng. Eng., **21**, 602, 1892.

Origin discussed (derived like albertite, uintahite, etc., from the oxidation of petroleum), I. C. White, Bull. G. Soc. Amer., **10**, 277, 1897.

GRAPHITE, pp. 7, 1086.—The relations of the different forms of carbon are discussed by Moissan, Ann. Ch. Phys., 8, 289, 806, 466, 1896, and C. R., 121, 538, 540, 1895. Also by Luzi, Ber. Ch. Ges., **24**, 4085, 1891, **25**, 214, 1878, 1892, **26**, 890, 1893; Zs. Nat. Halle, **64**, 224; B.-H. Ztg., **52**, 12, 1893 (cf. Jb. Min., **2**, 241 ref., 1893). Finally by Weinschenk, Zs. Kr., 28, 291, 1897. *Graphitite* of Luzi (l. c.), a supposed new form of amorphous carbon (cf. Zs. Kr., **24**, 639), is shown by Weinschenk to have no real distinctive characters.

On the graphite and associated minerals of the Passau region in Bavaria, see Weinschenk, Zs. Kr., 28, 185, 1897.

**Graphitite.**—See *Graphite.*

GREENOCKITE, pp. 69, 1086.—Occurs with wurtzite and smithsonite at the Lüderich mine, near Bensberg, Sonheur, Zs. Kr., **23**, 549, 1894. Also at Laurion, Greece, (analysis,) as a yellow pulverulent incrustation on an amber-colored smithsonite (with 2·70 CdO), A. C. Christomanos, Min. petr. Mitth., **16**, 360, 1896; C. R., **123**, 62, 1896.

**Grünlingite.** *W. Muthmann* and *E. Schröder*, Zs. Kr., **29**, 144, 1897.

Rhombohedral? Massive, with one distinct cleavage; resembling tetradymite. G. = 7·321. Color gray, tarnishing black.

Composition, $Bi_4TeS_3$ or Bi(Te,S) with Te : S = 1 : 3; this requires, tellurium 12·0, sulphur 9·1, bismuth 78·9 = 100. Analyses:

| | | |
|---|---|---|
| Te 12·82 | S 9·31 | Bi 79·31 = 101·44 |
| 12·66 | 9·40 | 78·82 = 100·88 |

From Cumberland, England; an approximate analysis was earlier made by Rammelsberg (Min. Ch., p. 5, 1875).

**Guanabacoite, Guanabaquite.**—See *Quartz.*

GUARINITE, p. 717.—The absence of titanium, early shown by Mauro, is confirmed by O. Rebuffat. Analysis gave:

| $SiO_2$ | $Y_2O_3$(?) | $Fe_2O_3$ | $Al_2O_3$ | $Ce_2O_3$ | CaO | $Na_2O$ | $K_2O$ |
|---|---|---|---|---|---|---|---|
| 34·84 | 1·23 | 1·69 | 25·37 | 3·45 | 25·20 | 6·57 | 1·56 = 99·91 |

Calculated formula: $2(Na,K)_2O.8CaO.5(Al,Fe,Ce)_2O_3.10SiO_2$. Lab. Chim. Napoli, 1894; abstract in Zs. Kr., **26**, 219, 1896.

GUMMITE (Eliasite), p. 892.—Investigations of gases yielded, Lockyer, Proc. Roy. Soc., **59**, 1, 1895.

**Gunnarite.** *G. Landström*, G. För. Förh., **9**, 368, 1887. A briefly described nickel-iron sulphide containing S 45 p. c., Ni 22, Fe 33; formula suggested $3FeS_2.2NiS$. Color tin-white with tinge of yellow, tarnishing yellowish brown. G. = 4·4. Not magnetic. Dissolves with difficulty in hydrochloric acid; more easily in aqua regia with separation of sulphur. Occurs embedded in pyrrhotite at Rud, parish of Skedevi, Östergötland.

GYPSUM, p. 983.—**Cryst.**—Discussion of symbols of doubtful forms, Cesàro, Bull. Ac. Belg., **29**, 335, 1895. Crystals from Girgenti with (350), Kraatz, Zs. Kr., **27**, 604, 1896. Harz, forms (510), (850), etc., Luedecke, Min. d. Harzes, 377, 1896. From the environs of Paris, forms $(\bar{2}03)$, (011), (031), $(\bar{2}11)$, $(\bar{5}49)$, (15·21·26), Lacroix, Bull. Soc. Min., **21**, 39, 1898, and N. Arch. Mus. Paris, **9**, 201.

On cleavage-planes, Cesàro, Ann. Soc. G. Belg., Mem., **22**, 23, 1895.

On gliding-planes, Nies, Zs. Kr., **30**, 662, 1899.

On etching-figures, Viola, Zs. Kr., **28**, 578, 1897; also K. von Kraatz, Zs. Kr., **30**, 662, 1899. Corrosion-figures due to loss of water, Sohncke, Zs. Kr., 30, 1, 1898.

Analysis of saline water contained in cavities in crystals from Sicily, Hj. Sjögren, Bull. G. Inst. Upsala, **1**, 277, 1893.

On the formation of incrustations in caves, G. P. Merrill, Proc. U. S. Nat. Mus., **17**, 77, 1894.

Gigantic crystals have been obtained from a cave at South Wash, Wayne Co., Utah, see Talmage, Science, **21**, p. 85, Feb. 17, 1893. On the occurring forms including (450) or (340) and (013), see Moses, School Mines Q., **14**, 325, 1893; also G. O. Smith, Johns Hopkins Univ., 112, May, 1894.

Crystals containing fine sand, about 50 p. c., occur at Carcote, Bolivia, Pohlmann, Vh. Ver. Santiago, **2**, 238, 1892. Also others similar from the Astrakan steppes described by Doss, Zs. G. Ges., **49**, 143, 1897.

**Hainite.** *Jos. Blumrich*, Min. petr. Mitth., **13**, 472, 1893.

Triclinic. In slender needles and plates. Twins tw. pl. *a* (100). Angles $ab = 78° 14'$, $b \wedge hk0, = 31½°$. Cleavage: *b* (010) rather perfect; *a* (100) faintly indicated. Brittle. H. = 5. G.

= 3·184. Luster vitreous to adamantine. Color wine-yellow, honey-yellow, colorless. Optically +. Ax. pl. ⊥ *b* and oblique to *a*. Ax. angle large. Dispersion strong; $\rho > v$. Birefringence low; $\gamma - \alpha = 0·012$. Pleochroism not marked; $\mathfrak{c} > \mathfrak{b} > \mathfrak{a}$.

Qualitative trials make it a silicate of sodium, calcium, titanium and zirconium; probably allied to wöhlerite, mosandrite, låvenite, etc.

Occurs in crystals in cavities, and in embedded needles or plates of the groundmass of the phonolite of the Hohe Hain, near Mildenau in northern Bohemia.

HALITE, pp. 154, 1036.—Description of crystals (artif.) with *h* (410), *n* (211), *p* (221), *r* (332). Traube, Jb. Min., **2**, 168, 1892. Starunia, crystals with the rare form (210), Pelikan, Min. petr. Mitth., **12**, 483, 1892.

Capillary relations of crystal faces with reference to the mother liquor (also of sylvite), Berent, Zs. Kr., **26**, 529, 1896.

Investigation of tenacity, Sella and Voigt, Wied. Ann., **48**, 636, 1893.

Refractive indices for long waves, Rubens and Snow, Wied. Ann., **46**, 529, 1892. Dispersion in the infra-red, Paschen, Wied. Ann., **53**, 337, 1894. Dispersion and absorption, Rubens and Trowbridge, Wied. Ann., **60**, 724, 1897; Am. J. Sc., **5**, 33, 1898.

The skeleton crystals of calcite (resembling chiastolite) embedded in black slate at West Springfield, Mass. (and at other points), and variously interpreted (see Min., p. 222), are shown to be pseudomorphs after salt by Emerson, Bull. U. S. G. Surv., **126**, 145, 1895.

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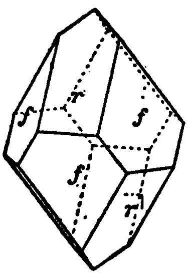


Hamlinite.

HAMLINITE, p. 762.—Occurs in crystals (Fig. 1) with the forms *r* (10$\bar{1}$1), *f* (02$\bar{2}$1) associated with bertrandite in Oxford Co., Maine; these (G. = 3·159–3·283) have been analyzed by Penfield (Am. J. Sc., **4**, 313, 1897) and the unknown composition of the mineral thus determined, viz.: $Al_3Sr(OH)_7P_2O_7$ or $[Al(OH)_2]_3[SrOH]P_2O_7$. In 2, the $SiO_2$, $Fe_2O_3$, $K_2O$, $Na_2O$ have been deducted as impurities.

| | $P_2O_5$ | $Al_2O_3$ | SrO | BaO | $H_2O$ | F | |
|---|---|---|---|---|---|---|---|
| 1. | 28·92 | 32·30 | 18·43 | 4·00 | 12·00 | 1·93 | $SiO_2$ 0·96, $K_2O$ 0·34, $Na_2O$ 0·40, $Fe_2O_3$ 0·90=100·18 [(less O 0·81) = 99·37 |
| 2. | 30·20 | 32·67 | 19·25 | 4·18 | 12·53 | 2·01 | = 100·84 (less O 0·84) = 100 |

**Hancockite.** *S. L. Penfield* and *C. H. Warren*, priv. contr.

Monoclinic. In very small, lath-shaped crystals and crystal aggregates. Habit like that of epidote. Forms *a* (100), *c* (001), *e* (101), *r* ($\bar{1}$01) and *n* ($\bar{1}$11). Approximate measurements of the angles gave values near those of epidote. Color of the mass brownish red; of an isolated crystal under the microscope, golden-brown for rays vibrating parallel to the axis of symmetry and somewhat variable for the direction at right angles to this. A crystal shows a delicate greenish-brown color near the termination and a pale rose at the attached end. Ax. pl. ∥ *b* (010). 2V = 50° approximately. Cleavage basal. H. = 6–7. G = 4·03.

Analysis (Warren) as yet incomplete, but shown to be a silicate of aluminum, ferric iron, lead, calcium and strontium. Yields a small amount of water and may be expected to conform to the general formula of the epidote group. Fusible B.B. with intumescence at 3 to a black globule. Alone on charcoal becomes magnetic. With soda on charcoal gives a coating of lead oxide. Insoluble in hydrochloric acid, but after fusion dissolves and yields gelatinous silica upon evaporation.

Occurs at Franklin, N. J., with clinohedrite, axinite, garnet, phlogopite, willemite, rœblingite, native lead and copper. Named after Mr. E. P. Hancock of Burlington, N. J.

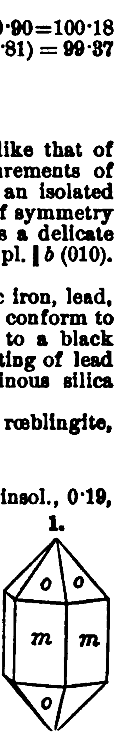
HANKSITE, p. 920.—Borax Lake, San Bernardino Co., Cal., analyses (deducting insol., 0·19, 0·121 p. c.), J. H. Pratt:

| | $SO_3$ | $CO_2$ | $Na_2O$ | Cl | K | |
|---|---|---|---|---|---|---|
| *Tabular cryst.* | 46·11 | 5·66 | 43·53 | 2·215 | 2·485 | = 100 |
| *Prismatic cryst.*, Fig. 1 | 45·92 | 5·65 | 43·74 | 2·29 | 2·40 | = 100 |

The chlorine is shown to be essential, and the following formula is obtained: $9Na_2SO_4.2Na_2CO_3.KCl$. Indices (Na): $\omega = 1·4807$, $\epsilon = 1·4614$. Am. J. Sc., **2**, 133, 1896.

On the formation of artificial crystals, A de Schulten, C. R., **123**, 1825, 1896.

1.



Hanksite.

**Hardystonite.** *J. E. Wolff*, Proc. Amer. Acad. Sc., **34**, 479, 1899.

Tetragonal. In granular masses showing good cleavages ∥ *c* (001), also secondary cleavages ∥ *a* (100) and *m* (110). H. = 3–4. G. = 3·396. Luster vitreous. Color white. Optically uniaxial, negative. Birefringence high.

Composition essentially $Ca_2ZnSi_2O_7$ or $2CaO.ZnO.2SiO_2$; perhaps related to ganomalite (Min., p. 422). Manganese replaces part of the zinc and magnesium of the calcium. Analysis (also others less complete):

| $SiO_2$ | ZnO | MnO | CaO | MgO | $Fe_2O_3$ | Ign. |
|---|---|---|---|---|---|---|
| 38·10 | 24·30 | 1·50 | 33·85 | 1·62 | 0·57 | 0·52 = 100·46. |

B.B. fuses with difficulty to a cloudy glass, giving a red calcium flame; on charcoal glows and yields a sublimate of zinc oxide. Gelatinizes easily with hydrochloric acid.

Obtained from the North Hill mine at Franklin Furnace, N. J. Occurs in a fine granular banded ore associated with willemite, rhodonite and franklinite. Named from the township in which the locality is situated.

HARMOTOME, p. 581.—Analysis from the Beaver mine, Thunder Bay district, Ontario, Hoffmann, Rep. G. Canada, 5, 16R, 1889–90.

**Hastingsite.** *F. D. Adams* and *J. B. Harrington*, Am. J. Sc., 1, 210, 1896.—See *Amphibole.*

**Hauchecornite.** *Scheibe*, Zs. G. Ges., 40, 611, 1888; Jb. preuss. G. Land., 1891, p. 91.

Tetragonal. Axis $\dot{c} = 1·05215$; $001 \wedge 101$ (*ce*) = 46° 27½′. Forms: *a* (100), *c* (001), *m* (110), *e* (101), *s* (112), *p* (111). Angles: *cp* = 56° 6′, *me* = *59° 10′. In tabular crystals, pyramidal or short prismatic. H. = 5. G. = 6·4. Luster metallic. Color light bronze-yellow.

Composition, $(Ni,Co)_7(S,Sb,Bi)_8$. Analyses, 1, R. Fischer; 2, 3, Hesse; 4, Fraatz:

| S | Bi | Sb | As | Ni | Co | Fe | Zn | Pb |
|---|---|---|---|---|---|---|---|---|
| 22·71 | 24·06 | 5·69 | 1·96 | 41·08 | 2·83 | 0·89 | 0·12 | 0·64 = 99·98 |
| 22·88 | 24·51 | 6·74 | 0·90 | 45·05 | 0·70 | 0·27 | — | 0·03 = 101·08 |
| 22·62 | 23·72 | 6·23 | 0·45 | 45·88 | 0·82 | 0·17 | — | — = 99·88 |
| 22·71 | 24·74 | 8·14 | 3·04 | 45·26 | — | *tr.* | — | Cu 0·09 = 98·98 |

Occurs with millerite, bismuthinite, etc., in cavities in siderite at the Friedrich mine, near Hamm a. d. Sieg, Prussia.

HAUSMANNITE, pp. 280, 1036.—Ilmenau, analyses, Gorgeu, Bull. Soc. Chim., 9, 653, 1893.

**Hautefeuillite.** *Michel*, Bull. Soc. Min., 16, 38, 1893, and C. R., 116, 600, 1893.

Monoclinic. In lamellar masses with radiated structure: these are made up of minute prismatic crystals with the forms *a* (100), *b* (010), *m* (110).

Cleavage: *b* perfect. H. = 2·5. G. = 2·435. Colorless. Transparent. Optically +. Ax. pl. ‖ *b*. $Bx_a$ inclined 45° to *a*. $2E_y = 88°$. $n_y = 1·52$. Dispersion $\rho < v$; inclined strong.

Composition, $(Mg,Ca)_3P_2O_8 + 8H_2O$. This is like bobierrite except in the calcium present. The two minerals also differ optically. Analysis:

| $P_2O_5$ | MgO | CaO | $H_2O$ |
|---|---|---|---|
| 34·52 | 25·12 | 5·71 | 34·27 = 99·62 |

B.B. exfoliates and fuses to a greenish-white globule. Dissolves with difficulty in acids.

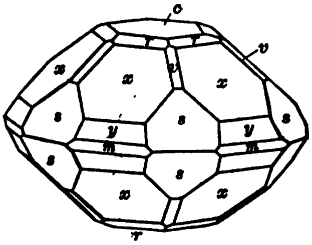
Occurs with apatite, monazite and pyrite at the mines of Ödegaarden, Bamle, Norway. Named after M. Hautefeuille.

HAÜYNITE, p. 431.—A variety from the Kaiserstuhl exhibits phosphorescence, Brauns, Jb. Min., 1, 84, 1899.

**Heazlewoodite.** *W. F. Petterd*, Catalogue of Minerals of Tasmania, p. 47, 1896. A sulphide of nickel and iron related to pentlandite, occurring in narrow bands in the serpentine of Heazlewood, Tasmania. Color light yellow-bronze; streak light bronze. Highly magnetic. H. = 5. G. = 4·61. Rich in nickel, up to 38 p. c., but not analyzed.

HEDENBERGITE.—See *Pyroxene.*

HEDYPHANE, p. 775.—Occurs in distinct crystals at the Harstig mine, Norway, with tephroite in calcite. Hexagonal; forms: *m*, *c*, *r*, *x*, $\alpha(30\bar{3}2)$, *y*, *v*, *s*; axis $\dot{c} = 0·7063$, or near that of apatite. Cleavage *x* $(10\bar{1}1)$. Hj. Sjögren, G. För. Förh., 14, 250, 1892; Bull. G. Inst. Upsala, 1, 11, 1893.



Hedyphane.

HEINTZITE, p. 885.—Crystals from Westeregeln examined by Bücking, Ber. Ak. Berlin, 58, 1895.

Luedecke remarks on the identity of heintzite, hintzeite and kaliborite (Min., p. 885), Zs. Ges. Nat. Halle, 64, 423, 1892.

**Helvite**, p. 434.—Schwarzenberg, associated with fluorite, scheelite, etc. Analysis after deducting fluorite (corresponding to 3·16 p. c. CaO): $SiO_2$ 39·33, FeO 4·45, MnO 44·43, BeO 14·92, $Al_2O_3$ 0·77, S 5·03 = 102·93. G. = 3·202. Miers and Prior, Min. Mag., **10**, 13, 1892.

Discussion of composition with the conclusion that the ratio Be : Mn + Fe + Zn is constant, = 1 : 1; hence the formula $3Be(Mn,Fe,Zn)SiO_4+(Mn,Fe,Zn)S$, Retgers, Zs. phys. Ch., **20**, 488, 1896

**Hematite**, pp. 213, 1037.—Cryst. study, Framont, Schweitzer [Inaug. Diss., Strassburg, 1892], Zs. Kr., **24**, 627, 1895. Crystals from Puy de la Tache, Mont Dore, with new forms, F. Gonnard, C. R., **126**, 1048, 1898. Artificial crystals with *μ* ($01\bar{1}5$), etc., Doss, Zs. Kr., **20**, 567, 1892.

Refractive indices measured, mean value for *A* 2·834, for *C* 2·964, Wülfing, Min. petr. Mitth., **15**, 68, 1895.

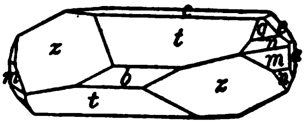
Occurrence of hematite and martite ores in Mexico, Hill, Am. J. Sc., **45**, 111, 1893.

On the action of a powerful magnet upon minerals containing iron, as hematite, limonite, siderite, franklinite, etc., see Wilkens and Nitze, Trans. Am. Inst. Mng. Eng., **26**, 351, Feb., 1896.

**Hercynite**, p. 223.—From the Veltlin forming a granular aggregate with corundum, sillimanite, etc., analysis by Linck, after deducting 2·8 p. c. pyrrhotite: $Al_2O_3$ 61·21, $Fe_2O_3$ 3·18, FeO 25·98, MgO 9·63 = 100. Ber. Ak. Berlin, 47, 1893.

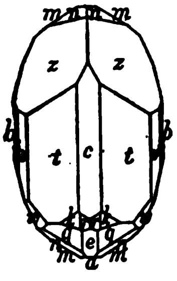
**Herderite**, p. 760.—Shown by Penfield (Am. J. Sc., **47**, 329, 1894) to be monoclinic in crystallization. Axes $\grave{a} : \bar{b} : \dot{c}$ = 0·63075 : 1 : 0·42742 ; *β* = *89° 54′ for crystals from Paris, Me. Forms: *a* (100), *b* (010), *c* (001) ; *m* (110), *l* (120), *μ* (130) ; *d* (101), *e* (302), 𝔢 ($\bar{3}02$), 𝔡 ($\bar{3}01$) ; *u* (011), *t* (032), *v* (031), *s* (061) ; *r* (112), *p* (111), *q* (332), *n* (331), *o* (441), 𝔮 ($\bar{3}32$), 𝔫 ($\bar{3}31$) ; *k* (122), *w* (3·12·4), 𝔯 ($\bar{1}21$), *x* ($\bar{3}62$), *z* ($\bar{3}94$), 𝔭 ($\bar{3}91$). Also *y* (131 or $\bar{1}31$). Angles *mm‴* = 64° 29′, *ct* = *45° 25′, *bv* = *37° 57′.

1.



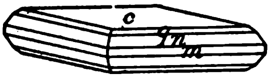
Paris.

2.



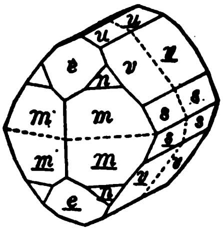
Paris.

3.



Hebron.

4.



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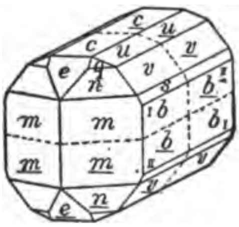

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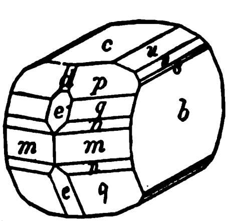
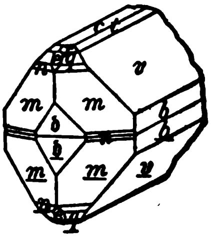


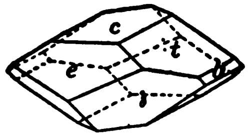
Figs. 4–6, Stoneham.

7.



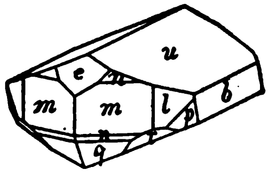
Auburn.

8.



Greenwood.

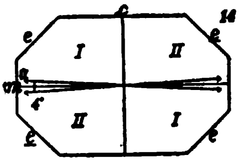
9.



Greenwood.

Crystals sometimes monoclinic in habit (Paris), but commonly penetration-twins with *c* (001) as tw. pl. and then pseudo-orthorhombic, analogous to stilbite (Figs. 4, 5). Sections ∥ *b* (010) show inclined extinction; $\mathfrak{c} \wedge \dot{c} = Bx_o \wedge \dot{c} = -2\tfrac{1}{2}°$ for Na. Dispersion inclined, distinct. $\beta = 1·682$, $2H_a = 70° 44'$ and ∴ $2V_a = 71° 59'$ for Na, Paris. Also $\beta = 1·612$, $2H_a = 66° 0'$, ∴ $2V_a = 68° 7'$, again $2E_a = 128° 25'$ for Na, Stoneham. Sections of twins show monoclinic character (Figs. 10, 11 (cf. Fig. 5)).

10.



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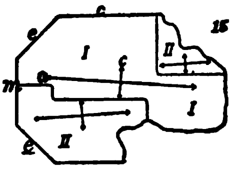


Stoneham.

The composition is shown to vary according to the relative amounts of fluorine and hydroxyl present, the general formula being $Ca[Be(F,OH)]PO_4$. The pure *fluor-herderite* has not been noted as yet, but the Stoneham mineral is a *hydro-fluor-herderite*, while that from Paris (new local.) and Hebron is *hydro-herderite* as shown below. Greenwood is another new locality affording both kinds. Analyses, 1, 2, H. L. Wells, quoted by Penfield, also Am. J. Sc., **44**, 114, 1892. Anal. 2 after deducting 5·27 insol.

| | G. | $P_2O_5$ | BeO | CaO | $H_2O$ | F | |
|---|---|---|---|---|---|---|---|
| Paris | 2·952 | 44·05 | 16·13 | 34·04 | 5·85 | — | insol. 0·44 = 100·51 |
| Hebron | 2·975 | 43·08 | 16·18 | [34·35] | 6·15 | 0·42 | = 100·18 |

**Hessite**, pp. 47, 1037.—San Sebastian distr., Jalisco, Mexico, analysis by J. S. de Benneville, quoted by Genth and Penfield, Am. J. Sc., **43**, 187, 1892.

Occurs in Yale district, Br. Columbia, Hoffmann, Rep. G. Canada, **8**, 11R, 1895.

**Heteromorphite**, p. 122.—See *Plagionite*.

**Heulandite**, p. 574.—Crystals described from Tulferthal, Tyrol, Habert, Zs. Kr., **28**, 250, 1897.

Relation in physical characters and composition to brewsterite, stilbite, etc., discussed by Rinne, Jb. Min., **1**, 12, 1892.

Analysis from the granite on the Struth, Thuringia, Fomme, Ber. phys.-med. Soc. Erlangen, **25**, 1893. Also from Anthracite Creek, Gunnison Co., Colo., Eakins, Bull. U. S. G. Surv., **90**, 62, 1892. From Pula, Sardinia (anal., 2·55 p. c. BaO), Lovisato, Rend. Accad. Linc., **6** (1), 260, 1897; Riv. Min. Ital., **18**, 33, 1898.

Results of treatment with sulphuric acid and hydrochloric acid, Rinne, Jb. Min., **1**, 139, 1896.

**Hislopite**, p. 266.—See *Calcite*.

**Hoeferite.** Höferite, *F. Katzer*, Min. petr. Mitth., **14**, 519, 1895.

Amorphous; earthy, granular or scaly. H. = 1–3. G. = 2·34 (air-dried). Luster glimmery to greasy. Color siskin-green, also apple- to grass-green. Streak slightly lighter. Adheres to the tongue.

Composition, $2Fe_2O_3.4SiO_2.7H_2O$; or $Fe_2O_3.SiO_2.H_2O$ if the water lost at 120° is neglected = Silica 35·2, iron sesquioxide 46·5, water 18·3 = 100. Hence closely related to chloropal (nontronite). Analyses:

| $SiO_2$ | $Fe_2O_3$* | $Al_2O_3$ | Ign. |
|---|---|---|---|
| 36·14 | 45·26 | 1·11 | 18·15 = 100·66 |
| 35·88 | 46·64 | | 18·20 = 100·72 |

* Includes a little FeO.

B.B. becomes reddish brown, then dark grayish black, and fuses with difficulty to a black magnetic slag. Insoluble in dilute acids, and only in part decomposed by hot sulphuric acid with separation of pulverulent silica.

Occurs at Křitz, near Rakonitz, Bohemia, at the formerly worked antimony mines. Named after Professor H. Hoefer of Leoben.

**Hopeite**, p. 808.—Crystals described from Moresnet, Belgium, G. Cesàro, Mem. Acad. Belg., **53**, 1897.

**Humite Group**, p. 535.—Analyses on carefully selected material, identified by crystallographic study, have enabled Penfield and Howe (Am. J. Sc., **47**, 188, 1894) to establish the following formulas for the three species of the group:

Chondrodite, $Mg_3[Mg(F,OH)]_2[SiO_4]_2$
Humite, $Mg_5[Mg(F,OH)]_2[SiO_4]_3$
Clinohumite, $Mg_7[Mg(F,OH)]_2[SiO_4]_4$

These formulas vary progressively by an increase of one molecule of ($Mg_2SiO_4$), and this variation is closely connected with the crystallization (see Min., p. 584). The vertical axes are in the ratio of 5 : 7 : 9, that is, of the total number of magnesium atoms present. The same result was reached at nearly the same time by Hj. Sjögren, Bull. G. Inst. Upsala, **2**, 39–54, 1894.

Penfield and Howe also remarked that another member of the series, having the composition $Mg[Mg(F,OH)]SiO_4$, was to be expected, whose axial ratio should be about 1·086 : 1 : 1·887, $\beta = 90°$. This would then give for the vertical axes of the four compounds the ratio of 3 : 5 : 7 : 9. A member of the group having this form was later discovered by Hj. Sjögren and called *Prolectite*. Though not yet analyzed, its composition is probably expressed by the formula given above. See *Prolectite*. Cf. also Lewis, Min. Mag., **11**, 137, 1896.

A full study of the form and optical characters of crystals of the three members of the group, humite, chondrodite, clinohumite, has been also given by Sjögren, G. För. Förh., **14**, 423, 1892; Bull. G. Inst. Upsala, **1**, 16–40, 1892.

A humite, occurring in serpentine in the Allalin region, Valais, Switzerland, contains no fluorine, having the composition $Mg_3(MgOH)_2(SiO_4)_3$, see analyses by Jannasch and Locke, Zs. anorg. Ch., **7**, 92, 1894; occurrence described by Schäfer, Min. Mitth., **15**, 126, 1895.

**HURONITE**, p. 340.—Investigation, chemical and microscopic, showing it to be a basic plagioclase, more or less altered to saussurite. Barlow, Ottawa Naturalist, **9**, 25; Jb. Min., **1**, 430 ref., 1897.

**Hydrocalcite.** *K. Kosmann*, B.-H. Ztg., No. 38, 1892; Zs. G. Ges., **44**, 155, 1892; Jb. Min., **1**, 260 ref., 1894. A soft white pulpy substance occurring in a limestone cave at Wolmsdorf, Glatz, Silesia. Dried over sulphuric acid, it yields the composition $CaCO(OH)_4$ or $CaCO_3.2H_2O$. When free from water it forms a "Bergmilch," containing needle-like crystals with strong double refraction. The author would regard the "Bergmilch" as a third form of calcium carbonate.

**HYDROFRANKLINITE**, p. 259.—See *Chalcophanite*.

**HYDROGIOBERTITE**, p. 305.—A mineral provisionally referred here, but perhaps new, has been noted by Brugnatelli at the amianthus deposits of Val Brutta. In loose aggregates of prismatic (orthorhombic) crystals, biaxial with parallel extinction. G. = 2·013. Analysis: $CO_2$ 21·85, MgO 43·32, $H_2O$ 34·32 = 99·49. Rend. Ist. Lombardo, **30**, 1109, 1897, and Riv. Min. Ital., **18**, 44, 1898; also Zs. Kr., **31**, 54, 1899.

**HYDROHERDERITE**.—See *Herderite*.

**HYDROZINCITE**, p. 299.—Analysis from Bleyberg, Belgium, G. Cesàro, Mem. Acad. Belg., **53**, 1897.

**ICE**, p. 205.—Photographs of snow-crystals, G. Nordenskiöld, Bull. Soc. Min., **16**, 59, 1893, and G. För. Förh., **20**, 163, 1898. Also by W. A. Bentley, noted by J. E. Wolff, Proc. Am. Acad., **33**, 431, 1898 and Bentley and Perkins, Pop. Sci. Monthly, May, 1898.

Resemblance of spherical crystals to chondrules in meteorites, Rinne, Jb. Min., **1**, 259, 1897.

Plasticity of crystals measured, Mügge, Jb. Min., **2**, 211, 1895.

Observed in hollow, hopper-like, hexagonal crystals, Grossmann, Proc. Roy. Soc., **54**, 113, 1894.

Density determined, E. L. Nichols, Phys. Rev., **8**, 21, 1899. The final results for 0° reached are: 0·9181 for natural ice, 0·9161 for artificial ice (obtained with $CO_2$ and ether).

**Iddingsite.** *A. C. Lawson*, Bull. G. Univ. Cal., **1**, 31, 1893. A mineral substance occurring in the carmeloite (augite-andesite) of Carmelo Bay, California, probably an alteration-product of chrysolite. Structure lamellar. Cleavage easy ∥ *a* (100); also parallel to a brachydome of 80°. H. = 2·5. G. variable, 2·839 a maximum. Luster on *a* (cleavage) bronze-like. Color brown. Optically biaxial. Ax. plane ∥ 010 and ⊥ *a* (cleavage). Pleochroism on *a* chestnut- and lemon-yellow. Absorption $\mathfrak{c} > \mathfrak{b} > \mathfrak{a}$. A silicate of iron, calcium and magnesium. B. B. infusible. Finally decomposed by hydrochloric acid. Named after Prof. J. P. Iddings of Chicago.

**Idrizite.** *A. Schrauf*, Jb. G. Reichs., **41**, 379, 1892. A sulphate related to botryogen from the Idria mercury mines in Carniola. Compact to cystalline. Color yellow-gray. H. = 3. G. = 1·829. Analysis gave: $SO_3$ 33·94, $Al_2O_3$ 8·59, $Fe_2O_3$ 8·70, Fe(Mn)O 3·10, MgO 4·51, $H_2O$ 40·80 = 99·64. The formula $(Mg,Fe)(Fe.Al)_2Si_3O_{13} + 16H_2O$ is deduced. Insoluble in hot or cold water, but soluble in dilute hydrochloric acid.

**ILMENITE**, p. 217.—Discussion of composition leading to formula $FeTiO_3$, Th. Koenig and O. von der Pfordten, Ber. Chem. Ges., **22**, 1488, 2070, 1889. This subject has been also treated by Penfield and Foote. A new analysis (Foote) of the crystallized mineral (G. = 4·345) from Layton's Farm, Warwick, N. Y., gave: (½) $TiO_2$ 57·29, $SiO_2$ 0·37, FeO 24·15, MgO 15·97, MnO 1·10, $Fe_2O_3$ 1·87 = 100·75. This (which confirms the analysis of Rammelsberg) yields the formula $RO.TiO_2$, where R = Mg and Fe. Hence it is inferred that the composition should be regarded as an isomorphous mixture of $MgO.TiO_2$ and $FeO.TiO_2$. Am. J. Sc., **4**, 108, 1897.

Variety containing 11·9 (½) p. c. MgO, from the Magnolia district, Colorado, analyzed by Whitaker (G. = 4·44), Colorado Sc. Soc., Feb. 5, 1898.

Analysis from Bedford Co., Va., Peck, Am. Ch. J., **19**, 232, 1897.

**ILVAITE**, pp. 541, 1037.—Occurs in crystals with rhodonite (bustamite) at Cap Bon-Garonne, Algeria, Gentil, Bull. Soc. Min., **18**, 410, 1895. Also occurs near the head of Barclay Sound, Vancouver Is., Br. Columbia (analysis), Hoffmann, Rep. G. Canada, **5**, 12R, 1889–90.

**INESITE**, p. 564.—Crystals from Jakobsberg, Nordmark, Sweden, described by Hamberg, show the forms: *a* (100), *b* (010), *c* (001), *d* (011), *g* (201), and *f* ($\bar{3}01$) new; analysis, G. Lundell: $SiO_2$ 42·92, MnO 36·31, PbO 0·73, CaO 8·68, MgO 0·37, $H_2O$ 10·48 (0·62 over $H_2SO_4$) = 99·49. G. För. Förh., **16**, 323, 1894.

**IOLITE**, p. 419.—Crystals from Selrain, Montavon and the Pitzthal in the Alps, described by Gemböck (new forms 350, 120, 160, 501, 351, 261, 281), Zs. Kr., **29**, 305, 1898.

Occurrence in an eruptive rock from S. Africa, Molengraaf, Jb. Min., **1**, 79, 1894.

Experimental investigation of conditions of formation in a magma, Morozewicz, Min. petr. Mitth., **18**, 22, 1898.

**IRON**, pp. 28, 1037.—Discussion of twinning structure, Linck, Zs. Kr., **20**, 209, 1892; Ann. Mus. Wien, **8**, 113, 1893. See also papers by Cohen on the investigation of meteoric iron, Ann. Mus. Wien, **7**, 143, 1892; **9**, 97, 1894; **12**, 42, 119, 1897.

Many papers on meteoric irons have been published (Am. J. Sc., Ann. Mus. Wien, Ber. Ak. Berlin, etc.) See also the classification of meteorites and catalogue of Vienna collection, Brezina, Ann. Mus. Wien, **10**, 231, 1895.

Terrestrial native iron occurs in minute spherules in feldspar in Cameron township, Nipissing district, Ontario, Hoffmann, Rep. G. Canada, **6**, 23R, 1895. Noted also in connection with the coal measures of Missouri, E. T. Allen, Am. J. Sc., **4**, 99, 1897.

The Coahuila and Toluca irons yield minute quantities of platinum, also iridium, Davison, Am. J. Sc., **7**, 4, 1899.

**JACKSONITE**, p. 531.—Examined by N. H. Winchell, who concludes that it is optically distinct from prehnite and thomsonite, but may perhaps be the same as lintonite (wh. see). Amer. Geol., **23**, 250, 1899.

**JADEITE**, p. 369.—Analyses of chloromelanite, Damour, Bull. Soc. Min., **16**, 57, 1893. From Mogoung, Burma, analysis, Farrington, Proc. U. S. Nat. Mus., **17**, 29, 1894.

Occurrence in Upper Burma described, Noetling, Jb. Min., **1**, 1, 1896 (Rec. G. Surv. India, **26**, 26, 1893); Bauer, *ib.*, p. 18; from "Thibet," Bauer, *ib.*, p. 85.

A soda-pyroxene, allied to jadeite, occurring with allurgite, at St. Marcel, Piedmont, has been investigated by Penfield. Tough, forming an interwoven aggregate of coarse prismatic crystals. Color ash-gray. G. = 3·26–3·38. Analysis (½): $SiO_2$ 54·59, $Al_2O_3$ 9·74, $Fe_2O_3$ 11·99, $Mn_2O_3$ 1·06, MnO 0·58, MgO 5·03, CaO 7·24, $Na_2O$ 9·32, $K_2O$ 0·24, $H_2O$ 0·37 = 100·16. Am. J. Sc., **46**, 291, 1893.

**JAMESONITE**, p. 122.—Occurs in East Kootanie, Br. Columbia, Hoffmann, Rep. G. Canada, **5**, 65R. Also from Barrie township, Frontenac Co., Ontario, *ib*, **6**, 30R, 1892–93.

On the historical relations of jamesonite and heteromorphite, see L. J. Spencer, Min. Mag., **12**, 58, 1899. The crystallized jamesonite from Bolivia is stated *not* to conform to $2PbS.Sb_2S_3$ (Rose's original formula was $3PbS.Sb_2S_3$).

**JAROSITE**, p. 974.—Occurs in auriferous quartzite at the Buxton mine, Lawrence Co., So. Dakota, W. P. Headden (analysis), Am. J. Sc., **46**, 24, 1892. Also at the Jarilla Mts., Doña Ana Co., N. M., Hidden, Am. J. Sc., **44**, 255, 1893. At Pisek, Bohemia, in crystals with *c*, *r*, *s* ($02\bar{2}1$), Krejči, Ber. Ak. Böhm., Feb. 21, 1896.

**JARROWITE**.—A local name for pseudomorphs of calcite, perhaps after celestite, from the Jarrow Docks, Durham, England (= pseudo-gaylussite, this Appendix, also Min., p. 907). See Miers, Min. Mag., **11**, 264, 897.

**JEFFERSONITE**.—See *Pyroxene*.

JORDANITE, pp. 141, 1039.—Further description of Binnenthal crystals, monoclinic in symmetry, with new forms, Baumhauer, Zs. Kr., **24**, 78, 1894.

**Josephinite.** *W. H. Melville*, Am. J. Sc., **43**, 509, 1892.
Massive, granular, forming the metallic portion of ellipsoidal pebbles whose sp. gravity is 6·204. Their complex composition is noted below; the metallic part has the following characters: Malleable and sectile. H. = 5. Luster metallic. Color gray. Opaque. Magnetic. Composition $Fe_2Ni_5$. Analysis gave (½): Fe 23·23, Ni 30·45. A little cobalt, copper and arsenic were also present; phosphorus was absent.

The pebbles consist of 13·38 p. c. of silicates, of which 12·88 p. c., soluble in HCl, is serpentine; the remainder, insoluble, is perhaps bronzite. A very small amount of chromite, magnetite, pyrrhotite are also present, further a trace of chlorine (0·04 p. c.) of uncertain relations. Occur in the placer gravel of a stream in Josephine and Jackson counties, Oregon, which it is inferred probably came from an eruptive dike in the vicinity. Deposits of nickel silicate occur in Douglas Co. to the south of the locality here noted (see Min., p. 677; also awaruite, Min., p. 29).

KAINITE, p. 918.—Analyses of kainite and other salts from Kalusz and Aussee, C. v. John, Jb. G. Reichs., **42**, 341, 1892.

KAINOSITE.—See *Cenosite.*

**Kalgoorlite.** *E. F. Pittman*, Rec. G. S. New South Wales, vol. **5** (separate).
Massive. Fracture subconchoidal. Color iron-black. G. = 8·791. Composition, $HgAu_2Ag_6Te_6$. Analysis by J. C. H. Mingaye:

| Te | S | Au | Ag | Hg | Cu |
|---|---|---|---|---|---|
| [37·26] | 0·13 | 20·72 | 30·98 | 10·86 | 0·05 = 100 |

Occurs at the telluride deposits at Kalgoorlie, West Australia. A yellow gold telluride (G. = 9·377) referred to calaverite is associated; this gave Te 56·65, Au 41·76, Ag 0·80 = 99·21.

**Kaliastrakanite.** Kalium-astrakanite, *J. K. van Heide*, Ber. Ch. Ges., **26**, 414, 1893; *Naupert* and *Wense, ibid.*, p. 873.—See *Leonite.*

**Kaliblödite.** *C. A. Tenne*, Zs. G. Ges., **48**, 632, 1896.—See *Leonite.*

**Kamarezite.** *K. Buss*, Ber. Ges. Bonn, **50**, 83, 1893; Jb. Min., **1**, 115, 1895.
Orthorhombic? In minute crystals, tabular ‖ *b* and vertically striated; terminations formed by two domes (assumed as 101 and 201 (*d*)); crystals in cavities of a crystalline mass. Cleavage: perfect ⊥ *b*. H. = 3. G. = 3·98. Color grass-green. Ax. pl. ‖ *b*. $Bx_a$ ⊥ cleavage. Ax. angle large.
Composition, $(CuOH)_2SO_4.Cu(OH)_2 + 6H_2O$, thus related to langite and arnimite. Analysis:

| $SO_3$ | $CuO$ | $FeO$ | $H_2O$ |
|---|---|---|---|
| (½) 17·52 | (½) 51·50 | 0·69 | [30·29] = 100 |

B.B. in the closed glass tube decrepitates strongly and gives off first water and then sulphuric acid. Insoluble in water, but readily soluble in ammonia and acids.
From Laurion, Greece; named from Kamareza in Greece.

**Katoforite.** *W. C. Brögger*, Die Eruptivgesteine d. Kristianiagebietes, **1**, 37, 73 (*et al.*), 1894; **3**, 169, 1898.—See *Cataphorite.*

**Kauaiite.** *Goldsmith*, Proc. Acad. Nat. Sc., Philad., 1894, 105. Occurs on the island Kauai, Hawaiian Is., as a soft, amorphous chalk-like mass. G. = 2·566. Analysis: $Al_2(SO_4)_3$ 7·18, $Al_2O_3$ 33·40, $K_2SO_4$ 17·00, $Na_2SO_4$ 4·91, $H_2O$ 31·57, X [5·94] = 100.

**Kehoeite.** *W. P. Headden*, Am. J. Sc., **46**, 22, 1893.
Massive, amorphous, forming seams and bunches in the ore (argentiferous galena with sphalerite and pyrite) of the Merritt mine, Galena, So. Dakota. G. = 2·34. Insoluble in water, soluble in dilute acids; becomes insoluble after ignition. Infusible. Analysis gave, after deducting 1·76 insoluble:

| $P_2O_5$ | $Al_2O_3$ | $Fe_2O_3$ | $ZnO$ | $CaO$ | $MgO$ | $H_2O$ | $SO_3$ |
|---|---|---|---|---|---|---|---|
| 27·13 | 25·29 | 0·79 | 11·74 | 2·75 | 0·08 | 31·60 | 0·51 = 99·89 |

This corresponds to $4R_2O_3.RO.5P_2O_5.9H_2O$. Of the water 14·2 per cent are lost between 105° and 110°, 3·34 between 115° and 120°; the remainder is expelled only at a red heat.

**Kentrolite**, pp. 544, 1089.—Described by Flink as occurring in crystals at Långban, Sweden, with barite and calcite, as noted in Min., p. 1089.

Crystals from Jakobsberg have been examined by G. Nordenskiöld. G.För. Förh., **16**, 158, 1894. Forms: *e* (102), *v* (115), *u* (114), *o* (111), *s* (221), *z* (3·15·10)? Habit usually pyramidal, *o*, *n*, with *m* and *e* small; rarely prismatic, *m*, *o*. Angles $pp^{iv}$ (111 ∧ $11\bar{1}$) = 62° 31·7′, $pp'$ (111 ∧ $\bar{1}11$) = 92° 34′. Ax. pl. (on Långban sections) ‖ *b*; also $\mathfrak{a} = \check{a}$, $\mathfrak{b} = \bar{b}$, $\mathfrak{c} = \dot{c}$. Birefringence high. Occurs with inesite.—See also *Melanotekite*.

**Kermesite**, p. 106.—Revision of crystallographic data with new forms, in part doubtful, Pjanitsky, Zs. Kr., **20**, 417, 1892; cf. also Goldschmidt, Kryst. Winkeltabellen, 389, 1897.

Discussion of composition, Baubigny, C. R., **119**, 737, 1894.

**Kieserite**, p. 932.—Occurs in crystals at Westeregeln with carnallite, etc.; new forms *c* (001), *y* (335), Bücking, Ber. Ak. Berlin, 533, 1895.

**Klinozoisite.** *E. Weinschenk*, Zs. Kr., **26**, 161, 433, 1896.—See *Clinozoisite*.

**Knebelite**, p. 457.—A variety containing magnesia (4·7 p. c. MgO) has been called *talk-knebelite* by Igelström (Jb. Min., 1, 248, 1890). It occurs with eisenknebelite (Min., p. 457) at the Hillång mine, Dalecarlia, Sweden.

**Knopite.** *P. J. Holmquist*, G. För. Förh., **16**, 73, 1894; also *ibid.*, **15**, 588, 1893.

A mineral closely related to perovskite (Min., p. 722), but containing cerium without niobium or tantalum and thus intermediate between it and dysanalyte (p. 724).

Type A is in cubo-octahedrons also with (911) and (920); color lead-gray; luster metallic; these show on a polished surface lamellæ, thus on *a*, parallel to the cubic edges, also diagonal. In thin sections optically biaxial with high birefringence and a lamellar structure. H. = 5–6. G. = 4·11.

Type B is in cubes, *o* very small or absent; penetration-twins with *o* as tw. pl.; without distinct lamellæ and opaque except in fine powder. H. = 5–6. G. = 4·21–4·29.

Composition corresponds to $RO.TiO_2$. Analyses:

| | $TiO_2$ | $ZrO_2$ | $SiO_2$ | $Ce_2O_3$ | $Y_2O_3$? | FeO | MnO | MgO | CaO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Type A. | 58·74 | 0·91 | 1·29 | 5·80 | 0·06 | 3·23 | 0·31 | 0·19 | 26·84 | 0·75 | 0·29 | 1·00=99·41 |
| 2. " | — | — | — | 5·15 | | 2·63 | — | — | 27·29 | 1·99 | | |
| 3. Type B. | 54·12 | — | — | 6·81 | — | 4·19 | — | — | 33·32 | 0·38 | 0·79 | 0·21=99·82 |
| 4. " | 56·30 | — | — | 4·46 | — | 5·15 | — | 0·35 | 32·22 | 0·39 | | 0·30=99·17 |
| 5. " | 54·52 | — | — | 4·42 | — | 4·94 | — | 0·32 | 32·84 | 1·68 | | 0·92=99·64 |

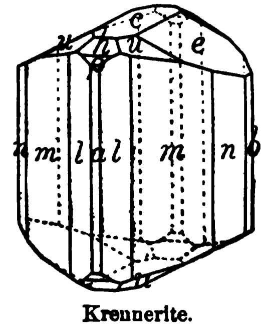
From Alnö, Sweden, and the neighboring mainland. Type A occurs in a limestone, crystalline, as a result of contact-metamorphism, with garnet, titanomagnetite, etc. Type B is from a brecciated limestone also in a syenitic rock. Named after Prof. A. Knop of Carlsruhe, who described dysanalyte.

**Kosmochlor.** *Laspeyres*, Zs. Kr., **27** 592, 1896.—Kosmochromit, *Groth*, Tab. Ueb., 132, 1898. —See *Cosmochlore*.

**Kosmochromite.**—See *Kosmochlor* and *Cosmochlore*.

**Krennerite**, pp. 105, 1089.—Chester quotes the results of an examination by Penfield of crystals from Cripple Creek, Colorado, which have the habit of Fig. 1. Myers obtained for them (deducting 1·21 insol.): Te 55·68, Au 43·86, Ag 0·46 = 100, or $AuTe_2$. The original Nagyág mineral contained silver. It is urged that calaverite is probably a sylvanite essentially free from silver. Am. J. Sc., **5**, 375, 1898. See also *Calaverite* and *Goldschmidtite*.

1.



Krennerite.

**Ktypeite.** *A. Lacroix*, C. R., **126**, 602, 1898. Calcium carbonate in the form of pisolites from Carlsbad, Bohemia, and Hammam-Meskoutine in Algeria; formerly referred to aragonite. The specific gravity varies from 2·58 to 2·70, or less than that of calcite. Birefringence = 0·020. In parallel polarized light a distorted black cross is noted, while portions give a positive black cross in converging light. Heated to low redness, the pisolites decrepitate and are finally transformed into calcite; the name given refers to this fact.

**Kubeite.** *L. Darapsky*, Jb. Min., 1, 163, 1898.—See *Cubeite*.

**Kylindrite.** *A. Frenzel*, Jb. Min., 2, 125, 1893.—See *Cylindrite.*

**Lagoriolite.** Kalk-Natron-Granat, Lagoriolith, *J. Morozewicz*, Min. petr. Mitth., 18, 147, 1898.—See *Garnet.*

**Lamprophyllite.** *W. Ramsay, V. Hackman*, Fennia, 11, No. 2, p. 119, Helsingfors, 1894. Also *W. Ramsay, ibid.*, 3, No. 7, p. 45, 1890.

A mineral related to astrophyllite in form and cleavage, occurring in the nephelite-syenite of Lujavor-Urt, peninsula of Kola, Russian Lapland. Occurs macroscopically in minute flattened prisms with mica-like cleavage. Color yellow-brown and luster submetallic. Obtuse negative bisectrix with large axial angle symmetrically normal to cleavage. Pleochroism distinct, $\mathfrak{c}$ brown-yellow, $\mathfrak{b}$ bright golden-yellow. Absorption $\mathfrak{c} > \mathfrak{b}$ (for astrophyllite $\mathfrak{b} > \mathfrak{c}$). In thin sections, a form (110) was noted inclined 41° to 42° with the cleavage (100), also terminations. Twins common, parallel the direction of elongation; also polysynthetic twinning. Pleochroism distinct, $\mathfrak{a}$, $\mathfrak{b}$ straw-yellow, $\mathfrak{c}$ orange-yellow.

These observations agree with earlier ones by Ramsey (l. c.); he remarks on the resemblance to låvenite, noting also a form (210) inclined 27° to 100. G. = 3·45. Absorption $\mathfrak{a} \leqq \mathfrak{b} < \mathfrak{c}$. Birefringence lower than with ægirite. Contains silica, titanium, iron, manganese, and sodium.

**Lamprostibian.** *L. J. Igelström*, G. För. Förh., 15, 471, 1893; Zs. Kr., 22, 467, 1893. A partially described mineral from the Sjö mine, Örebro, Sweden. Occurs in foliated or scaly forms. H. = 4. Brittle. Luster brilliant. Opaque and color lead-gray, except in very thin layers, then blood-red in color. Streak red. Not magnetic. Difficultly soluble in hot concentrated hydrochloric acid without evolution of chlorine. Inferred to be an anhydrous antimonate of iron and manganese (FeO,MnO).

**LANARKITE**, p. 928.—Artificial production of crystals, A. de Schulten, Bull. Soc. Min., 21, 142, 1898.

**LÅNGBANITE**, Longbanite, pp. 548, 1039.—Crystals from Långban examined by Hj. Sjögren (Bull. G. Inst. Upsala, 1, 41, 1892) are shown to be rhombohedral, not hexagonal. Crystals complex; habit varied, prismatic or tabular, sometimes with prominent rhombohedral development.

Also occurs with rhodonite, manganophyllite, braunite, calcite, at the Sjö mine, *ibid.*, 2, 96, 1894. Analyses by R. Mauzelius quoted by Sjögren:

| | G. | $Sb_2O_3$ | $Fe_2O_3$ | $SiO_2$ | $MnO_2$ | MnO | CaO | Mg | $H_2O$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Långban | 4·65 | 11·76 | 14·15 | 12·23 | 26·15 | 31·54 | 2·24 | 1·61 | — | = 99·68 (O 3·50) |
| 2. " | 4·73 | 11·61 | 14·81 | 11·32 | 27·13 | 32·30 | 2·04 | 0·36 | 0·32 | = 99·89 (O 3·70) |
| 3. " | 4·83 | 12·92 | 4·33 | 8·95 | 35·15 | 36·39 | 1·95 | 0·47 | — | = 100·16 (O 5·03) |
| 4. Sjö mine | 4·60 | 12·51 | 13·98 | 12·82 | 24·36 | 32·22 | 2·40 | 1·11 | 0·52 | = 99·92 (O 3·09) |

The formula calculated is $m\mathrm{Sb_2O_3}.n\mathrm{Fe_2O_3}.p\overset{\mathrm{IV}}{\mathrm{R}}\overset{\mathrm{II}}{\mathrm{R}}\mathrm{O_3}$; a relation to hematite is suggested.

**Langbeinite.** *S. Zuckschwerdt*, Zs. ang. Ch., 356, 1891. *O. Luedecke*, Zs. Kr., 29, 255, 1897.

Isometric-tetartohedral. Observed forms: *a* (100), *o* (111), $o_1$ $(1\bar{1}1)$, *d* (110), *y* (920), *f* (310), *e* (210), $p_1$ $(2\bar{2}1)$, *n* (211). Crystals highly modified.

Fracture conchoidal. H. = 3–4. G. = 2·81–2·86. Luster greasy to vitreous. Colorless when fresh, but speedily taking up water when exposed to the air. Tasteless. Index $n_y$ = 1·5329. Shows no circular polarization.

Composition, $K_2Mg_2(SO_4)_3$ or $K_2SO_4.2MgSO_4$ = Potassium sulphate 42·1, magnesium sulphate 57·9 = 100. Analyses: 1, 2, Zuckschwerdt, Zs. ang. Ch., 356, 1891. 3, Edw. Wagner, quoted by Luedecke:

| | $K_2SO_4$ | $Mg_2SO_4$ | $CaSO_4$ | $MgCl_2$ | MgO | NaCl | $H_2O$ |
|---|---|---|---|---|---|---|---|
| 1. *Colorless* | 41·30 | 58·20 | — | 0·22 | 0·08 | — | 0·20 = 100 |
| 2. *Grayish-white* | 38·99 | 58·55 | 0·57 | 0·55 | 0·13 | 0·43 | 0·78 = 100 |
| 3. *Colorless.* G. = 2·81 | 41·0 | 58·1 | — | — | — | — | 1·0 |

Occurs in beds of rock salt (taking the place of polyhalite) at Wilhelmshall near Anderbeck, and at Thiederhall; also at Westeregeln and Neu-Strassfurt as a secondary mineral; at Solvayhall near Bernburg with carnallite. Named after A. Langbein of Dessau.

**LAUMONTITE**, p. 587.—Anal., from the Plauenschen Grund, Dresden, Zschau, Abh. Ges. Isis, p. 90, 1893. Caucasus (also of stilbite), Zjemjatschensky, Zs. Kr., 25, 574, 1895. Grand Marais, Minn., Berkey, 23 Ann. Rept. Minn. G. Surv., p. 196.

**LAURIONITE**, p. 171.—Twin crystals with rectangular axes from Laurion, noted by Lacroix, C. R., 123, 955, 1896. See also (new forms) G. F. Herbert Smith, Min. Mag., 12, 102, 1899.
On the formation of artificial crystals, also of (PbBrOH), A. de Schulten, Bull. Soc. Min., 20, 186, 194, 1897.
See also *Paralaurionite*.

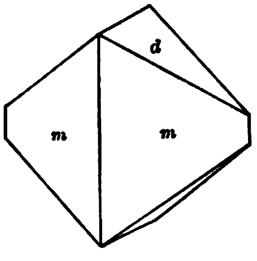
**LAUTARITE**, p. 1040.—Crystals examined by Osann showed the forms : *b* (010), *c* (001), *m* (110), *l* (120), *r* (101), *n* ($\bar{1}$01), *q* (011); habit prismatic. Angles : *mm'''* = *62° 38', *qq'* = *63° 36', *mr* = *46° 31', whence $\dot{a} : \bar{b} : \dot{c}$ = 0·6331 : 1 : 0·6462, $\beta$ = 73° 38'. Zs. Kr., 23, 586, 1894.
Crystals artificially produced, A. de Schulten, Bull. Soc. Min., 21, 144, 1898.

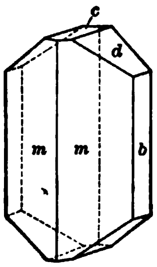
**LAUTITE**, p. 148.—Analysis of the pure mineral gave Frenzel : S 17·88, As 45·66, Cu 36·10 = 99·64. This leads to the formula CuAsS. Min. petr. Mitth., 14, 125, 1894.

**LÅVENITE**, pp. 375, 1040.—Reported as occurring in nephelite-syenite of Paisano Pass, Davis Mts., Texas, Osann, 4th Ann. Rep. G. Surv. Texas, 128, 1892.

**Lawsonite.** *F. Leslie Ransome*, Bull. Univ. California, 1, 301, 1895. *Ransome* and *Palache*, Zs. Kr., 25, 531, 1895.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·66524 : 1 : 0·7385. Forms : *b* (010), *c* (001), *m* (110), *d* (011), *δ* (041). Angles : *mm'''* = *67° 36', *dd'* = *72° 58½'. Crystals rather large, prismatic or tabular ∥ *c*, also distorted by extension of an *m*-face. Twins : tw. pl. *m*. Faces *m*, *d* striated ∥ intersections with *c*.





Cleavage : *b* very perfect ; *c* perfect ; *m* indistinct. Fracture uneven. Brittle. H. = 8·25. G. = 3·084, 3·091. Luster vitreous to greasy. Color pale blue to grayish blue. Absorption distinct; 𝔞 > 𝔟 > 𝔠. Pleochroism distinct in thick sections : 𝔞 blue, 𝔟 yellowish or colorless, 𝔠 colorless ; colors often in bands. Optical +. Ax. pl. ∥ *b*. $Bx_a \perp c$. Ax. angles : $2H_{a.y}$ = 88° 27', $2H_{o.y}$ = 108° 16', ∴ $2V_{a.y}$ = 84° 6'. Indices for Na : $\alpha$ = 1·6650, $\beta$ = 1·6690, $\gamma$ = 1·6840, $\gamma - \alpha$ = 0·019.

Composition, $H_4CaAl_2Si_2O_{10}$ or $Ca[Al(OH)_2]_2[SiO_3]_2$ Groth. Hence, analogous to carpholite (Min., p. 549). Analyses, 1, Ransome ; 2, Palache :

| | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | $Na_2O$ | $H_2O$ | |
|---|---|---|---|---|---|---|---|---|
| 1. | 38·10 | 28·88 | 0·85 | 18·26 | 0·28 | 0·65 | 11·42 | = 98·39 |
| 2. | 37·32 | 35·14 | | 17·83 | — | — | 11·21 | = 101·50 |

B.B. becomes clouded and fuses easily to a colorless, blebby glass. Yields water in the closed tube. Resists acids, but easily decomposed with gelatinization after ignition. The specific gravity of the ignited powder was 2·558.

Occurs in a crystalline schist (lawsonite-schist), which is associated with serpentine in the Tiburon peninsula, Marin Co., California. The schist also contains glaucophane abundantly, actinolite, margarite, epidote, garnet ; also rutile, titanite. Further in glaucophane-schist at other points near Berkeley, and probably at Sulphur Creek, Sonoma Co., Cal. Also observed in the metamorphic rocks of the Piedmontese Alps near Elva, Val Maira and at other points (Franchi, Bull. Soc. Min., 20, 5, 1897, and Att. Accad. Torino, 32, 260, 1896). In the massive rocks (gabbro-diabase-peridotite types) of the Southern Apennines, on the boundary between the provinces of Basilicata and Calabria (Viola, Zs. Kr., 28, 553, 1897). In the glaucophane rocks of Corsica ; also in New Caledonia (Lacroix, Bull. Soc. Min., 20, 309, 1897).

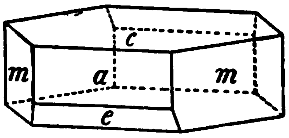
Named after Prof. A. C. Lawson of the University of California.

**LAZULITE**, p. 798.—Occurs with quartz near Lake Mistassini, Quebec, Hoffmann, Rep. G. Canada, 5, 66R, 1889-90.

**LEAD**, p. 24.—Occurs with rœblingite, native copper, etc., at Franklin Furnace, N. J., W. M. Foote, Am. J. Sc., 6, 187, 1898.
On artificial crystals with hexagonal pseudo-symmetry, Miers, Min. Mag., 12, 113, 1899 ; A. Dick, *ibid.*, p. 118.

**Leadhillite**, p. 921. Occurs at Granby, Mo., in well-formed prismatic crystals (Figs. 1, 2). Pirsson and Wells. Am. J. Sc., **48**, 219, 1894. Wells obtained on pure material: $SO_3$ 7·83, $CO_2$ 8·14, PbO 82·44, $H_2O$ 1·68 = 99·59, confirming the formula given by Groth (Dana Min., p. 921),

1.



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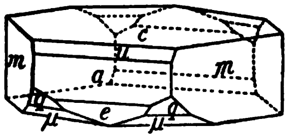


which is equivalent to $PbSO_4.2PbCO_3.Pb(OH)_2$. Pseudomorphs after calcite and galena also observed, W. M. Foote, *ibid.*, **50**, **99**, 1895.

Occurs in ancient lead slags from the Mendip Hills, L. J. Spencer, Rep. Brit. Assoc., 1898.

**Lembergite.** *Lagorio* [Trav. Soc. Nat. Varsovie, 6, xi, 7–9, 1895], Zs. Kr., **28**, 526, 1897. This is the artificial mineral, $5Na_2Al_2Si_2O_8 + 4H_2O$, called by Lemberg nephelin-hydrat (see Zs. G. Ges., **39**, 562, 1887).

**Leonite.** Kalium-Astrachanite, *J. K. van der Heide*, Ber. Ch. Ges., **26**, 414, 1893; *Naupert* and *Wense*, *ibid.*, p. 873. Leonite, *C. A. Tenne*, Zs. G. Ges., **48**, 632, 1896. Kaliastrakanite. Kaliblödite.

Monoclinic. Axes $\grave{a} : \bar{b} : \grave{c} = 1{\cdot}03855 : 1 : 1{\cdot}23365$, $\beta = {}^{*}84° 50'$. Forms: *b* (010), *c* (001), *μ* (120); *d* (102), *δ* ($\bar{1}$02); *o* (013), *n* (011); *q* (113), *p* (111), *π* ($\bar{1}$11). Angles: $\mu\mu' = 51° 36'$, $nn' = 101° 43'$, $cp = {}^{*}57° 1'$, $pp' = {}^{*}74° 21'$ Tenne.

In tabular crystals, also commonly massive. Cleavage not distinct. Fracture conchoidal. Luster vitreous. Colorless, white or yellowish. Ax. pl. ± *b*. $Bx_a$ nearly ⊥ *c* (001).

Composition, probably $K_2SO_4.MgSO_4 + 4H_2O$, the potash salt corresponding to blödite (astrakanite), which is known as an artificial compound (van der Heide). Groth calls attention to the fact that the correspondence in form is apparently not what would be expected, Zs. Kr., **30**, 655, 1899. Analysis, Tenne:

| $SO_4$ | Mg | K | Cl | $H_2O$ | insol. |
|---|---|---|---|---|---|
| 43·73 | 6·54 | 25·48 | 4·84 | 18·99 | 0·42 = 100 |

Occurs usually massive, also in crystals with kainite, in the salt deposits of Westeregeln, and Leopoldshall, Germany.

**Lepidolite**, p. 624.—Tanagama Yamo, Japan, analysis of grayish-white or slightly pinkish plates, Genth, Am. J. Sc., **44**, 387, 1892.

Composition of the lithia micas discussed by F. W. Clarke, J. Am. Chem. Soc., **15**, No. **5**, 1893; Bull. U. S. G. Surv., **113**, 1893.

**Lepidomelane**, p. 634.—Occurs with arsenopyrite at the Bob Neil mine, Marmora, Hastings Co., Ontario (analysis by Wait), Hoffmann, Rep. G. Canada, **6**, 14R, 1892–93.

**Leucite**, pp. 341, 1041.—Discussion of optical characters, relation to analcite, etc., Klein, Jb. Min., Beil.-Bd., **11**, 475, 1898 (Ber. Ak. Berlin, 290, 1897).

Occurs (chiefly altered to analcite) in a leucite-tephrite associated with elæolite-syenite at Hamburg, Sussex Co., N. J., Kemp, Am. J. Sc., **45**, 298, 1893; **47**, 339, 1894. In bowlders in the auriferous gravels of the Horsefly river, Cariboo district, Br. Columbia, Hoffmann, Rep. G. Canada, **7**, 14R, 1894. In the Highwood and Bearpaw Mts, Montana, Weed and Pirsson, Am. J. Sc., **2**, 143, 1896. In igneous rocks, Province of Rome, Viola, Jb. Min., **1**, 121, 1899. In the lavas of the lower Celebes (Wichmann).

**Lewisite.** *E. Hussak* and *G. T. Prior*, Min. Mag., **11**, 80, 1895.

Isometric. In minute octahedrons. Cleavage octahedral, nearly perfect. H. = 5·5. G. = 4·950. Luster vitreous to resinous. Color honey-yellow to colophony-brown. Streak light yellowish brown. Translucent.

Composition, $5CaO.2TiO_2.3Sb_2O_5$; closely related to mauzeliite. Analyses, Prior:

| $Sb_2O_5$ | $TiO_2$ | CaO | FeO | MnO | $Na_2O$ |
|---|---|---|---|---|---|
| 67·52 | 11·35 | 15·93 | 4·55 | 0·38 | 0·99 = 100·72 |
| 65·52 | 11·70 | 15·47 | 6·79 | — | 1·06 = 100·54 |

Fuses rather readily on the edges in the Bunsen flame, coloring it greenish blue. In salt of phosphorus yields a bead, yellow when hot and violet when cold. Insoluble in acids.

From the cinnabar mine of Tripuhy, near Ouro Preto, Minas Geraes, Brazil; occurs in the gravel, consisting largely, after washing, of cinnabar and hematite; also xenotime, monazite, zircon, cyanite, rutile, etc. Named after Prof. W. J. Lewis of Cambridge, England.

A new titano-antimonate of iron in slender six-sided (*m*, *a*) crystals of a resinous black color, G. = 4·529, was also noted, but owing to lack of material it has not yet been fully investigated.

**Libollite.** *J. P. Gomes*, Comm. Dir. Trabalhos Geol. Portugal, **3**, 244, 290, 1896–98. A kind of asphaltum occurring near Libollo, in western Africa, has been called *libollite* by Gomes. It resembles albertite, having a pitch-black color, brilliant luster, and more or less conchoidal fracture. H. = 2·5; G. = 1·1. An analysis by A. Machado and A. Noronha gave: C 80·30, H 8·41, O 9·45, N 1·84 = 100. The ash (6·92 p. c.) has been deducted. Compare albertite and grahamite, Min., p. 1020.

LINARITE, p. 927.—From San Giovanni mine, Sardinia, crystals described by Brugnatelli (new form (718)), also optical characters. Optically –. Ax. pl. and $Bx_o \perp b$. $Bx_a \wedge \dot{c} = -24°$ (hence $Bx_a$ nearly coincident with the normal to *s* ($\bar{1}01$)). $2H_a = 106° 21'$ red, $= 106° 42'$ Na, $= 110° 12'$ blue. $2V_a = 79° 59'$ Na. Indices $\alpha = 1·8092$, $\beta = 1·8380$, $\gamma = 1·8598$. Riv. Min. Ital., **17**, 56, 1897, and Zs. Kr., **28**, 307, 1897.

Occurs in New Caledonia, Lacroix, C. R., **118**, 553, 1894.

**Lindesite.** *L. J. Igelström*, Zs. Kr., **23**, 590, 1894.—See *Urbanite*.

LINTONITE, p. 607.—Shown by N. H. Winchell to differ in optical characters from thomsonite, with which it agrees chemically and to which it has been referred. Amer. Geol., **22**, 348, 1898.

LIROCONITE, p. 858.—Cornwall, analysis by Church, Min. Mag., **11**, 3, 1895.

LÖLLINGITE, p. 96.—Occurs at Drum's Farm, Alexander Co., N. C., massive, G. = 7·081, analysis, Genth: As 27·93, S 0·77, Fe 70·83, Cu *tr.* = 99·53. Am. J. Sc., **44**, 384, 1892.

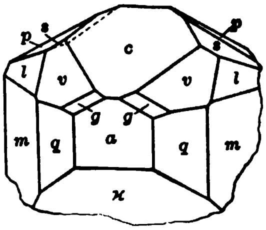
Also occurs in Galway township, Peterborough Co., Ontario, analysis (2·88 p. c. Co) by Johnston, Hoffmann, Rep. G. Canada, **6**, 19R, 1892–93.

LONGBANITE.—See *Långbanite*.

**Lorandite.** *J. A. Krenner* [Mat. es Értesitö, **12**, 473, 1894; **13**, 258, 1895], Zs. Kr., **27**, 98, 1897. *Goldschmidt*, Zs. Kr., **30**, 272, 1898.

Monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1·3291 : 1 : 1·0780$. $\beta = 52° 27'$ Goldschmidt. Forms: *a* (100, *t*), *b* (010), *c* (001, *a*); *q* (210), *ε* (320), *m* (110, *x*), *e* (120), *μ* (130), *u* (140)?; *β* ($\bar{2}05$), *d* ($\bar{1}01$), *κ* ($\bar{2}01$, *c*); *α* (034), *h* (045), *w* (021); *v* (112), *s* ($\bar{1}12$), *z* ($\bar{1}11$); *g* (425), *f* (212), *γ* (748), *j* (536); *ι* (324)?, *l* (122), *δ* (1·13·8)?; *y* ($\bar{3}12$), *n* ($\bar{5}25$), *p* ($\bar{2}12$), *r* ($\bar{2}11$), *ζ* ($\bar{3}24$), *k* ($\bar{3}22$), *η* ($\bar{2}·5·10$)? Angles $ac = 52° 57'$, $mm''' = 98° 0'$, $qq''' = 55° 24'$, $c\kappa = 89° 29'$.

Crystals highly modified, often tabular, or prismatic (*m*); faces in prismatic zone vertically striated, especially *m* (*x*). A similarity to miargyrite is noted (cf. Gdt.). Cleavage: *a* perfect; *c* and *d* (101) good. Flexible, separating easily into cleavage lamellæ. H. = 2–2·5. G. = 5·529 Loczka. Luster metallic-adamantine. Color cochineal- to carmine-red, often dark lead-gray on the surface and frequently covered with an ocher-yellow powder. Streak dark cherry-red. Translucent to transparent. Refractive index high.



Lorandite, Gdt.

Composition, a sulpharsenide of thallium, $TlAsS_2$ or $Tl_2S.As_2S_3$ = Sulphur 18·7, arsenic 21·9, thallium 59·4 = 100. Analysis by J. Loczka:

S 19·02 As [21·47] Tl 59·51 = 100.

B.B. on charcoal fuses easily, colors the flame bright green, yields arsenical fumes and volatilizes completely. In the closed tube fuses and yields a black sublimate of thallium sulphide, also an orange one of arsenic sulphide, further some arsenic oxide. Soluble in nitric acid with separation of sulphur.

From Allchar in Macedonia, where it occurs in crystals implanted upon realgar.

The position of Goldschmidt is here provisionally accepted: 100, 001, 110, $\bar{2}01$ of Gdt. correspond to $\bar{1}01$, 100, $\bar{1}21$, 001 of Krenner.

**Lossenite.** *L. Milch*, Zs. Kr., 24, 100, 1894.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·843 : 1 : 0·945 approx. In acute pyramids, resembling scorodite in angle, with $pp' = 79°$ and $pp''' = 64°$. Color brownish red, often altered on the surface. Optically +. Ax. pl. $\parallel a$. Bx. $\perp c$.

Composition probably $2PbSO_4.3(FeOH)_3As_2O_8 + 12H_2O$. Analysis:

| $As_2O_5$ | $SO_3$ | PbO | $Fe_2O_3$ | $H_2O$ | $H_2O$ |
|---|---|---|---|---|---|
| 33·44 | 3·74 | 10·63 | 34·53 | 3·74 | 11·81[a], $SiO_2$ 1·13, $CaCO_3$ 1·46 = 100·48 |

[a] Water of crystallization.

From Laurion, Greece, where it was found in a drusy ferruginous quartzose rock.

Lovenite.—See *Låvenite.*

**Lutécine, Lutécite.** *Michel-Lévy* and *Munier-Chalmas*, Bull. Soc. Min., 15, 159, 1892.—See *Quartzine.*

**Mackintoshite.** *W. E. Hidden*, Am. J. Sc., 46, 98, 1893.

Tetragonal, in square prisms with pyramid; commonly massive, nodular. Fracture small subconchoidal. H. = 5·5. G. = 5·438. Luster dull. Color black. Opaque. In composition allied to thorogummite (Min., p. 893); perhaps $UO_2.3ThO_2.3SiO_2.3H_2O$. Analyses, W. H. Hillebrand:

| $SiO_2$ | $UO_2$ | $ZrO_2$? | $ThO_2,Ce_2O_3$ | $La_2O_3,Y_2O_3$ | PbO | FeO | CaO | MgO | $K_2O$ | $(Na,Li)_2O$ | $P_2O_5$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13·90 | 22·40 | 0·88 | 45·30 | 1·86 | 3·74 | 1·15 | 0·59 | 0·10 | 0·42 | 0·68 | 0·67 | 4·81[a] = 96·50 |
| 13·92 | 21·86 | *undet.* | | | 3·92 | — | 0·44 | 0·13 | 0·70 | | 0·46 | 0·35[b] |

[a] Above 100° 4·31, below 0·50. [b] Below 100°.

From the gadolinite locality of Llano Co., Texas. The alteration of mackintoshite seems to have yielded thorogummite. Named after James B. Mackintosh (died 1891), chemist of New York City.

Magnesioferrite, p. 226.—Roc de Cuzeau, Mont Dore, France, crystals (largely made up of plates of hematite) similar to those of Mte. Somma, Lacroix, Bull. Soc. Min., 15, 11, 1892.

Magnesite, p. 274.—Crystals from Val Lanterna, Brugnatelli, Zs. Kr., 31, 55, 1899.

Magnetite, pp. 224, 1041.—Occurs in cubic crystals, in part penetration-twins, at the Moss mine, Nordmark, Sweden. Hj. Sjögren, Bull. G. Inst. Upsala, 2, 63, 1894.

Crystals described from Acquacetosa, near Rome, new forms (520), (331), Zambonini, Riv. Min. Ital., 21, 21, 1898.

Magnetic properties of crystals investigated, Weiss, Bull. Soc. Min., 20, 187, 1897.

Present in various minerals (hematite, etc.), and thus giving them magnetic properties, Liversidge, Trans. Austr. Assoc. Adv. Sci., 1892.

Occurs at the Kodúr mines, Vizagapatam, Madras, India, containing manganese (2·08 $Mn_3O_4$) and alumina (2·54 p. c $Al_2O_3$), G. = 5·045. Holland, Rec. G. Surv. India, 26, 164, 1893.

Ch. Friedel shows that slow heating in the air at a rather high temperature changes crystals to hematite (i.e. martite). Bull. Soc. Min., 17, 150, 1894.

A titaniferous variety containing nickel occurs in Eastern Ontario, W. G. Miller, Rep't Bureau of Mines, Toronto, 7, Part III, p. 230, 1898.

**Magnetostibian.** *L. J. Igelström*, Zs. Kr., 23, 212, 1894. A partially investigated mineral from the Sjö mine, Örebro, Sweden. Occurs in grains and granular aggregates. Luster metallic. Color and streak black. Magnetic. An analysis (after deducting 68·6 p. c. impurities, $CaCO_3$, $MgCO_3$ and tephroite) gave:

$Sb_2O_5$ 9·83 $As_2O_5$ 1·54 $Fe_2O_3$ 12·36 FeO 17·16 MnO 59·11 = 100

Magnochromite, p. 228.—See *Chromite.*

Magnofranklinite.—A local name (credited to Koenig) for a highly magnetic franklinite containing little zinc. From Sterling Hill, N. J.; see Rep. G. Surv. N. J., 2, (1) 14, 1892; also Chester, Dict. Names Minerals, 164, 1896.

Malachite, p. 294.—Artificial formation by a new process, A. de Schulten, C. R., June 8, 1896.

**Maltesite.** *J. J. Sederholm*, G. För. Förh., 18, 390, 1896.—See *Andalusite.*

**Manganandalusite.** *H. Bäckström*, G. För. Förh., 18, 386, 1896.—See *Andalusite.*

**Manganberzeliite.** *L. J. Igelström*, Zs. Kr., 23, 592, 1894.—See *Berzeliite.*

MANGANITE, p. 248.—Crystals from the Harz described, Luedecke, Min. d. Harzes, 237, 1896. Analyses, Ilfeld, Gorgeu, Bull. Soc. Chim., 9, 650, 1893.

MANGANOSITE, p. 207.—Discussion of origin at Långban and Nordmark, Hj. Sjögren, G. För. Förh., 20, 25, 1898.

MARCASITE, pp. 94, 1041.—Crystals from Capo Schino, Sicily, described, G. La Valle, Riv. Min. Ital., 13, 3, 1893.

Occurs at Pontpéan, Ille-et-Vilaine, forming with galena pseudomorphs after pyrrhotite with regular orientation of its minute crystals, Lacroix, Bull. Soc. Min., 20, 223, 1897, and C. R., 125, 265, 1897.

Occurs in spear-head forms in the Raritan clay at Sayreville, near New Brunswick, N. J., Hamilton, Proc. Acad. Nat. Sc. Philad., 485, 1898.

See also *Pyrite.*

MARIPOSITE, p. 1041.—Analyses by Hillebrand of green and white varieties are quoted by Turner. The former (G. = 2·817) contains chromium, the latter has none (G. = 2·787); a similarity to pinite is noted. Am. J. Sc., 49, 377, 1895,

**Marshite.** *Liversidge, C. W. Marsh*, Proc. Roy. Soc. N. S. W., 26, 326, 1892. *Miers*, Zs. Kr., 24, 207, 1894.

Isometric-tetrahedral. Fracture subconchoidal. Brittle. Luster adamantine. Color oil-brown. Streak orange-yellow. Translucent. Consists essentially of cuprous iodide, $Cu_2I_2$. Occurs in cerussite or anglesite at the Broken Hill mines, New South Wales.

MARTITE, p 216.—See *Magnetite.*

**Masrite.** *H. Droop Richmond* and *Hussein Off*, J. Ch. Soc., 61, 491, 1892. A fibrous alum from Egypt, containing a small amount of cobalt and the supposed new element *masrium* (called after the Arab name of Egypt). Composition, $RO.Al_2O_3.4SO_3.20H_2O$. Analysis:

| $SO_3$ | $Al_2O_3$ | $Fe_2O_3$ | MgO | MnO | CoO | FeO | $H_2O$ | |
|---|---|---|---|---|---|---|---|---|
| 36·78 | 10·62 | 1·63 | 0·20 | 2·56 | 1·02 | 4·23 | [40·35] | insol. 2·61 = 100 |

MASSICOT, p. 209.—Occurs in the lead slags of Laurion, Greece.

**Mauzeliite.** *Hj. Sjögren*, G. För. Förh., 17, 313, 1895.

Isometric. In octahedrons, *o* (111), with *a* (100) and *m* (311). H. = 6–6·5. G. = 5·11. Color dark brown, lighter in fragments, and of the powder light yellow or yellowish white. Translucent.

In composition, a titano-antimonate of lead and calcium chiefly. Assuming that the water is present as (CaOH), the ratio calculated is $\overset{\text{II}}{\mathrm{R}}\mathrm{O}:\mathrm{TiO_2}:\mathrm{Sb_2O_5}:\mathrm{F} = 4:1:2:1$. It is related to lewisite, p. 42 Analysis, R. Mauzelius:

| | $Sb_2O_5$ | $TiO_2$ | PbO | FeO | MnO | CaO | MgO | $K_2O$ | $Na_2O$ | F | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ⅔ | 59·25 | 7·93 | 6·79 | 0·79 | 1·27 | 17·97 | 0·11 | 0·22 | 2·70 | [3·63] | 0·87=101·53 less (O=F) 1·53=100 |

Occurs with svabite and calcite at Jakobsberg, Wermland, Sweden; these minerals form narrow veins in a mixture of hausmannite, limestone, a yellow garnet, schefferite and manganophyllite.

MELANOPHLOGITE, pp. 194, 1041.—Discussion of conditions of formation, G. Friedel, Bull. Soc. Min., 15, 49, 1892; Bombicci, *ibid.*, p. 144. Investigated by Bombicci, Accad. Sc. Ist. Bologna, March 22, 1891.—Giona, G. Spezia, Riv. Min. Ital., 11, 37, 1892.

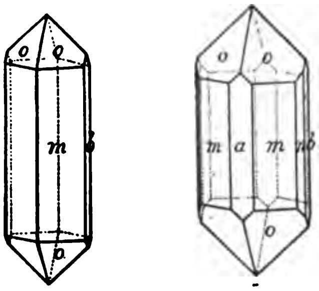
**Melanostibian.** *L. J. Igelström*, G. För. Förh., 14, 583, 1892; Zs. Kr., 21, 246, 1893. Massive, foliated; also in microscopic crystals H. = 4. Luster metallic. Color black. Streak cherry-red. Composition, perhaps $6(Mn,Fe)O.\ Sb_2O_3$. Analysis (assuming the state of oxidation as given):

| $Sb_2O_3$ | FeO | MnO | CaO | MgO | $H_2O$ |
|---|---|---|---|---|---|
| 37·50 | 27·30 | 29·62 | 1·97 | 1·03 | 1·06 = 98·48 |

From the Sjö mine, Örebro, Sweden, where it occurs in veins in dolomite.

**Melanotekite**, p. 545.—Occurs in prismatic crystals with *a* (100), *m* (110), *d* (110), *o* (111), *s* (221) at Pajsberg, Sweden, G. Nordenskiöld, G. För. Förh., **16**, 158, 1894; in habit and angles resembling kentrolite.

1. 2.



Melanotekite, New Mexico.

Also found at Hillsboro, New Mexico, associated with cerussite and a brown jasper-like material, C. H. Warren. Crystals (Figs. 1, 2) with forms *a* (100), *b* (010), *m* (110), *n* (130), *k* (150), *o* (111). Habit like kentrolite, angles $oo'' =$ *119° 13′, $oo''' =$ *55° 0′, $mm''' =$ 64° 44′ (calc.). Axes $\breve{a} : \bar{b} : \dot{c} =$ 0·6338 : 1 : 0·9127 (Nordenskiöld obtained 0·6216 : 1 : 0·9041). Analysis gave:

| G | $SiO_2$ | PbO | $Fe_2O_3$ | X | $H_2O$ |
|---|---|---|---|---|---|
| ‡ 5·854 | 15·49 | 55·56 | 27·51 | 0·82 | 0·68 = 100·06 |

whence the formula $Fe_4Pb_3Si_3O_{15}$ or $(Fe_4O_3)Pb_3(SiO_4)_3$. It is shown that the analogous formula $(Mn_4O_3)Pb_3(SiO_4)_3$ probably belongs to kentrolite (p. 39, Min. p. 544). Am. J. Sc., **6**, 116, 1898.

**Melanterite**, p. 941.—Laurion, Greece, analysis of zinc-bearing variety, L. Michel: $SO_3$ 28·85, FeO 17·74, ZnO 8·92, $H_2O$ 44·21 = 99·72. Bull. Soc. Min., **17**, 204, 1894.

Discussion of the chemical constitution and genesis of various iron sulphates, Scharizer, Zs. Kr., **30**, 209, 1898.

**Melilite**, p. 474.—Crystals from Vesuvius described with new form (201), Kaiser, Zs. Kr., **31**, 24, 1899. Discussion of microscopic structure, Gentil, Bull. Soc. Min., **17**, 108, 1894.

Composition discussed, Bodländer, Jb. Min., **1**, 15, 1893; cf. Vogt, *ibid.*, **2**, 73, 1892.

Occurs at Ste. Anne de Belleville, near Montreal, Canada, in alnoite, F. D. Adams, Am. J. Sc., **43**, 269, 1892; also (optically *positive*) in alnoite of Manheim, N. Y., C. H. Smith, *ibid.*, **46**, 104, 1893. Cf. Berwerth, Ann. Mus. Wien, **10**, 75, 1895.

Formed by the burning of Portland cement, Bodländer, Jb. Min, **1**, 53, 1892.

A soda-alumina silicate, tetragonal, and resembling melilite in habit, which occurs in the new rock-type farrisite, from Norway, has been called *natronmelilith* by Brögger (Die Eruptivgesteine d. Kristianiagebietes, **3**, 69, 1898). It is largely altered to natrolite. A later examination (*ibid.*, p. 366) has led to the conclusion that it should perhaps be referred to the Scapolite Group.

A new type of rock containing melilite, a chrysolite-melilite-leucite rock, occurs as a volcanic cone at San Venanzo, Umbria, Italy, and is called *venanzite*, by Sabatini Boll. Com. Geol., Sept., 1898. The same rock was later described by Rosenbusch and by him named *euctolite* (Ber. Ak. Berlin, 110, 1899).

**Mesabite.**—See *Göthite.*

**Metabrushite**, p. 828.—Brushite, or metabrushite, occurs with minervite (wh. see) in the limestone caves of the Nummulite limestone of Southern France; thus in the Grotto of Minerva on the Cesse, Valley of the Aude, Gautier, C. R., **116**, 1171, 1893.—See also *Brushite.*

**Metacinnabarite**, pp. 62, 1041.—Idria, discussion of occurrence, paragenesis, etc.; crystals are dodecahedral in habit with also *a* (100) and *o* (111), Schrauf, Jahrb. G. Reichs., **41**, 349, 1891.

Occurs at San Joaquin, Orange Co., California, in iron-black particles in barite; G. = 7·706; analysis: S 13·69, Hg 85·89. Cl 0·32 = 99·90, Genth, Am. J. Sc., **44**, 383, 1892.

Also occurs amorphous filling cavities in quartz on the west side of Read Is., near Vancouver Is., Br. Columbia, Hoffmann, Rep. G. Canada, **5**, 66R, 1889–90.

**Metadesmine.** *F. Rinne*, Jb. Min., **1**, 57, 1897.—See *Stilbite.*

**Metanocerine.** *Sandberger*, Jb. Min., **1**, 221, 1892. A partially investigated mineral occurring with the babingtonite of Arendal in white crystals resembling bromlite; H. = 4·5. From the qualitative analysis a possible relation to nocerite (Min., p. 174) is inferred, and the name provisionally given refers to this.

**Metascolecite.** *F. Rinne*, Jb. Min., **2**, 51, 60, 1894.—See *Scolecite.*

**Mica Group**, p. 611.—Discussion of the crystalline form based upon the percussion-figure, the etching-figures, etc. It is concluded that probably phlogopite, biotite and perhaps the lithia micas should be regarded as triclinic; muscovite appears to be monoclinic. T. L. Walker, Am. J. Sc., **7**, 199, 1899.—See also G. Friedel, Bull. Soc. Min., **19**, 18, 1896.

General discussion of chemical composition, F. W. Clarke, Bull. U. S. G. Surv., **113** and **125**, 1893; Clarke and Schneider, Am. J. Sc., **43**, 378, 1892.

Analyses are quoted by Stelzner, Zs. prakt. Geol., **4**, 377, 1896.

MICROLINE, pp. 322, 1042.—From the Spessart, analysis, E. Philippi, Ber. Senck. Nat. Ges., 1896, p. 125. Analyses, Jones Falls, Maryland, Hillebrand, Bull. U. S. G. Surv., **113**, 110, 1893.—See also *Anorthoclase*.

MICROLITE, pp. 728, 1042.—Igaliko, Greenland, approximate analysis of impure material, G. Nordenskiöld, G. För. Förh., **16**, 336, 1894.

Occurs at Rumford, Me., in honey-yellow crystals, G. = 5·17 (Penfield), Foote, Am. J. Sc., **1**, 461, 1896.

**Miersite.** *L. J. Spencer*, Nature, **57**, 574, 1898.

Isometric-tetrahedral. In small cubes, with *o* (111) and $o_1$ $(1\bar{1}1)$, the latter differing in size but not in luster. Twins: tw. pl. *o*. Cleavage: dodecahedral. Brittle. Luster adamantine. Color pale to bright yellow. Streak the same or deeper. Optically isotropic.

Composition essentially silver iodide, probably $Ag_2I_2$, analogous to marshite, $Cu_2I_2$ (this Appendix, p. 45), and nantokite, $Cu_2Cl_2$ (Min., p. 154).

From the Broken Hill mines, New South Wales, associated with chalcocite, garnet, quartz; also with malachite, anglesite. Named after Prof. H. A. Miers of Oxford, England.

MILARITE, p. 312.—Analysis, Treadwell, $SiO_2$ 72·79, $Al_2O_3$ 10·12, CaO 11·32; MgO *tr.*, $K_2O$ 4·32, $Na_2O$ 0·21, $H_2O$ 1·19 = 100. Jb. Min., **1**, 167, 1892.

MILLERITE, p. 70.—Occurrence (also of other nickel minerals) in the Rhine region, Laspeyres, Vh. Nat. Ver. Bonn, pp. 143, 375, 1893.

MILOSIN.—See *Avalite*.

**Minervite.** A. Gautier, Ann. Mines, **5**, 23, 1894; C. R., **116**, 928, 1022, 1171, 1271, 1893. An aluminium phosphate, $Al_2O_3.P_2O_5.7H_2O$, occurring with phosphate of lime as a white plastic mass mixed with clay, etc., in the "Grotte de Minerve" on the shores of the Cesse, Valley of the Aude, France. Analyses of impure material are given. The above formula applies to air-dried material.

**Mitchellite.** *J. H. Pratt*, Am. J. Sc., **7**, 286, 1899.—See *Chron*

MIZZONITE, p. 471.—Franco obtained $ar$ = 67° 56′ and 67° 58′; also $\omega_y = 1·568$, $\epsilon_y = 1·545$, Giorn. Min., **5**, 198, 1894.—See also *Wernerite*.

MOLYBDENITE, pp. 41, 1042.—Crystals from Frankford, Penn., examined by A. P. Brown, are hexagonal in habit, prismatic or barrel-shaped, resembling some mica. Forms as interpreted: *c* (0001), *m* $(10\bar{1}0)$. *o* $(10\bar{1}1)$, *p* $(20\bar{2}1)$, *q* $(30\bar{3}1)$. Angles: $co$ = *65° 35′, $cp$ = 77° 13′, $cq$ = 81° 24′; axis $\dot{c} = 1·9077$. Proc. Acad. Nat. Sc. Philad., 210, 1896

Occurs in large crystals (3·5 × 5·5 in. and 2 or 3 in. thick) with native bismuth, etc., at Kingsgate, Glen Innes, N. S. W., Liversidge, Rec. Austr. Mus., **2**, 1892.

MONAZITE, p. 749.—Cryst.—Nil-Saint-Vincent, Belgium, Franck, Bull. Acad. Belg., **21**, 40, 1891. Brazil, Hussak, Min. petr. Mitth., **12**, 470, 1892. South Lyme, Conn., occurs in distinct crystals, Matthew, School Mines Q., **16**, 232, 1895.

Occurrence on New York island, Niven, Am J. Sc., **50**, 75, 1895. Distribution in European rocks, Derby, Min. Mag., **11**, 304, 1897. Distribution in U. S., and elsewhere, U. S. G. Surv., 16 Ann. Rept., Pt. IV, p. 667. Occurs rather abundantly in the gold sands of southern Idaho, Lindgren, Am. J. Sc., **4**. 63, 1897.

Yields helium and other gases, Ramsay, Collie and Travers, J. Ch. Soc., **65**, 684, 1895; also Ramsay and Travers, Proc. Roy. Soc., **60**, 442, 1897. Also Erdmann, Ber. Ch. Ges., **29**, 1710, 1896.

MORDENITE, p. 573.—Relation in composition to ptilolite, Clarke, Am. J. Sc., **44**, 101, 1892.

MORENOSITE, p. 940.—Zermatt, analysis of magnesium variety, Pisani: $SO_3$ 28·7, NiO 18·5, MgO 6·5, $H_2O$ 46·5 = 100·2. Bull. Soc. Min., **15**, 48, 1892.

MORONITE.—A mixture of calcium carbonate with the remains of foraminifera, cf. S. Calderon [Anal. Soc. Espagñ. Hist. Nat., **23**, 21, 1894], Zs. Kr., **26**, 331, 1896.

**Mossite.** *W. C. Brögger*, Vidensk. Skrift. I. Math.-nat. Klasse, No. 7, Christiania, 1897.

Tetragonal. Axis $\dot{c} = 0·6488$; 001 ∧ 101 = 32° 46½′. Forms: *a* (100), *c* (001), *m* (110), *φ* (6·9·10), *y* (305), *e* (101), *v* (301), *s* (111). *cp* = 42° 19′, *mp* = *47° 41′. Crystals small; commonly twins with tw. pl. *e*, these often prismatic, elongated parallel a pyramidal edge analogous to twins of rutile (cf. Fig., Min., p. 1047, and Fig. 1 of tapiolite, this Append.), hence simulating orthorhombic forms; also drillings, fourlings. Cleavage none. G. = 6·45. Luster metallic, brilliant. Color black.

Composition, Fe(Nb,Ta)$_2$O$_6$, like tapiolite, with probably Nb : Ta = 1 : 1. Analysis, G. Thesen:

| Nb$_2$O$_5$,Ta$_2$O$_5$ | SnO$_2$ | FeO |
|---|---|---|
| 82·92 | 0·18 | 16·62 = 99·72 |

Occurs very sparingly, with yttrotantalite and columbite on feldspar, in a pegmatite vein at Berg near Moss, Norway.

**Munkforssite.** *L. J. Igelström*, Zs. Kr., **27**, 601, 1896.

Massive, foliated or small granular; the grains apparently monoclinic in crystallization. Cleavage in one direction. H. = 5. Color white or pale reddish.

Near svanbergite in composition. Analysis after deducting 10·74 p. c. insol.:

SO$_3$ 15·12 P$_2$O$_5$ 16·01 Al$_2$O$_3$ 29·23 CaO 36·64 ign.(SO$_3$ ?) 3·00 = 100

B. B. infusible and does not yield a blue color with cobalt solution; only partially decomposed by acids.

Occurs in the cyanite of a damouritic quartzite at Horrsjöberg, Westanå, and Dicksberg in the Ransät parish, Wermland, Sweden. Named from the Munkforss iron-works.

**Munkrudite.** *L. J. Igelström*, Zs. Kr., **28**, 311, 1897. Near svanbergite in composition, containing P$_2$O$_5$,SO$_3$,FeO,CaO, but not analyzed. Occurs foliated and crystalline; colorless to yellow. From Munkerud, near Dicksberg, Wermland, Sweden.

**MUSCOVITE**, p. 614.—Percussion-figure shown to deviate from the assumed normal position; thus the angle between the rays opening opposite *b* (010) was found to be 53° to 56° instead of 60°; similarly in other micas, e.g. in phlogopite (Ceylon) this angle was 63½°. T. L. Walker, Am. J. Sc., **2**, 5, 1896.

From Matawatchan, Renfrew Co., Ontario, analysis by Wait (1·26 Cr$_2$O$_3$), quoted by Hoffmann, Rep. G. Canada, **5**, 21R, 1889–90.

*Fuchsite* (2·73 p. c. Cr$_2$O$_3$) occurs in Habersham Co., Ga., in emerald-green scales, analysis, Genth, Am. J. Sc., **44**, 388, 1892. On the occurrence of fuchsite in the Swiss Alps, see J. Erb, Nat. Ges. Zürich, **43**, 276, 1898.

Analysis of compact variety, G. Friedel, Bull. Soc. Min., **21**, 135, 1898.

On certain new silicates yielded in synthetic experiments, C. and G. Friedel, Bull. Soc. Min., **22**, 17, 20, 1899.

See *Baddeckite.*

**NAGYAGITE**, p. 105.—Occurs at the Sylvia mine, Tararu creek, New Zealand, J. Park, Austr. Assoc. Adv. Sci., **3**, 150, 1891.

**NANTOKITE**, p. 154.—From the Broken Hill mines, New South Wales, Liversidge. Occurs in indistinct crystals in a matrix of cuprite with native copper and cerussite. G. = 4·7. Analysis by Carmichael: Cl 35·92, Cu 64·28 = 100·20. Also Min. Mag., **10**, 326, 1894 (but here Cl = 35·82). [Proc. R. Soc. N. S. W., **28**, 96, June 6, 1894.]

See also *Marshite* and *Miersite.*

**Nasonite.** *S. L. Penfield* and *C. H. Warren*, priv. contr.

Massive, granular, cleavable and probably monoclinic. Luster greasy. Color white.

Composition, (Ca,Pb)$_{10}$Cl$_2$Si$_6$O$_{21}$. Analysis:

| SiO$_2$ | PbO | CaO | MnO | ZnO | FeO | Cl | (OH) |
|---|---|---|---|---|---|---|---|
| 18·47 | 65·84 | 11·20 | 0·90 | 0·84 | 0·10 | 2·80 | 0·26 = 100·41 |

B.B. on charcoal, decrepitates, but fuses easily when powdered, giving a lead flame and coating of PbO. In closed tube decrepitates, giving off a little H$_2$O and an abundant sublimate of lead chloride.

Occurs at Franklin Furnace, N. J., associated with brown garnet, yellow axinite, glaucochroite (wh. see) and a little franklinite. Named after Mr. F. L. Nason, formerly of the Geological Survey of the State of New Jersey.

**NATROLITE**, pp. 600, 1042.—Crystals described, from Puy-de-Dôme, Gonnard, Bull. Soc. Min., **15**, 221, 1892. Also, with analysis, Magnet Cove, Arkansas, W. H. Melville, Bull. U. S. G. Surv., **90**, 38, 1892.

Analysis, from the Plauenschen Grund, Dresden, Zschau, Abh. Ges. Isis, p. 100, 1893.

Weed and Pirsson conclude from the analysis of a portion (G. = about 2·30) of the leucite rock called by them *missourite*, from the Highwood Mts., Montana, that it probably consists of analcite and a new potash zeolite, $(K_2,Ca)Al_2Si_3O_{10}.2H_2O$. This would correspond to a natrolite containing potassium and calcium in place of sodium. Am. J. Sc., **2**, 319, 1896.

**Natronberzeliite.**—See *Berzeliite.*

**Natrongranat.**—See *Garnet.*

**Natronmelilith.**—See *Melilite.*

**Natronmikroklin.**—See *Anorthoclase.*

**Natronrichterite.**—See *Astochite* and *Richterite.*

**NEOCHRYSOLITE**, p. 455.—Identical with fayalite according to Wichmann, Zs. Kr., **28**, 588, 1897.

**NEPHELITE**, pp. 423, 1042.—Crystals from Vesuvius, with new form $(51\bar{6}0)$, Kaiser, Zs. Kr., **31**, 24, 1899. Relation to davyne also discussed.

Discussion of symmetry of crystallization and twinning, etc., as revealed by etching, etc., Traube, Jb. Min., Beil.-Bd., **9**, 466, 1895.

Occurrence in New Zealand, Ulrich, Trans. Austr. Assoc. Sc., **3**, 127, 1891.

From the nephelite-syenite of Dungannon, Ontario, analysis by Harrington, Am. J. Sc., **48**, 16, 1894.

Artificial formation of a purely potash compound, Duboin, C. R., **115**, 56, 1892.

**Neptunite.** *G. Flink*, G. För. Förh., **15**, 196, 467, 1893; Zs. Kr., **23**, 346, 1894. *G. Nordenskiöld*, G. För. Förh., **16**, 346, 1894.

Monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1·3164 : 1 : 0·8076$; $\beta = {}^*64° \, 22' = 001 \wedge 100$. $100 \wedge 110 = 49° \, 53'$, $001 \wedge 101 = 23° \, 36\frac{1}{2}'$, $001 \wedge 011 = 36° \, 3\frac{1}{2}'$. Forms: *a* (100), *b* (010), *c* (001); *m* (110); *e* $(\bar{2}01)$, *d* $(\bar{3}01)$; *s* (111), *v* (221); *o* $(\bar{1}11)$; *u* $(\bar{5}12)$. Angles: $mm''' = {}^*99° \, 46'$, $cs = {}^*35° \, 51'$, $cm = 78° \, 49'$, $ss' = 55° \, 36'$. In prismatic crystals, with *c* (001) and *u* $(\bar{5}12)$ prominent. Twins: tw. pl. *c*.

Cleavage: *m* distinct. Fracture conchoidal. Brittle. H. = 5–6. G. = 3·234. Luster vitreous. Color black; in very thin splinters deep blood-red. Streak cinnamon-brown. Nearly opaque. Optically +. Ax. pl. ⊥ *b*. $Bx_a \wedge \dot{c} = +18°$. Pleochroic; absorption $\mathfrak{c} > \mathfrak{b} > \mathfrak{a}$.

In composition, a titano-silicate of iron (manganese) and the alkali metals; formula $\overset{\text{I}}{R}_2\overset{\text{II}}{R}TiSi_4O_{12}$, with $\overset{\text{I}}{R} = Na : K = 3 : 1$ and $\overset{\text{II}}{R} = Fe : Mn = 2 : 1$. Neptunite is therefore related in composition to titanite, and as Flink shows there is also a rather close correspondence in angle.

Analyses, 1, Flink. 2, O. A. Sjöström, G. För. Förh., **15**, 393, 1893.

| | | $SiO_2$ | $TiO_2$ | FeO | MnO | CaO | MgO | $K_2O$ | $Na_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 1. | | 51·53 | 18·13 | 10·91 | 4·97 | — | 0·49 | 4·88 | 9·26 = 100·17 |
| 2. | [illegible] | 51·93 | 17·45 | 10·23 | 5·32 | 0·71 | — | 5·71 | 9·63 = 100·98 |

Obtained from Greenland, the locality probably not the well-known Kangerdluarsuk, but rather Narsasik, near Igaliko. It occurs closely associated with ægirite (whence the name), also eudialyte, arfvedsonite, etc.

**Nickel-skutterudite.**—See *Skutterudite.*

**NITER**, p. 871.—Occurs in cavities of the leucite rocks of North Table Butte, Leucite Hills, Wyoming. In the rock of the Boar's Tusk of the same region, soda niter also occurs. Cross, Am. J. Sc., **4**, 118, 1897.

**Northupite.** *Warren M. Foote*, Am. J. Sc., **50**, 480, 1895. *J. H. Pratt*, *ibid.*, **2**, 123, 1896.

Isometric, in octahedrons. Cleavage none. Fracture conchoidal. H. = 3·5–4. G. = 2·380. Colorless when perfectly pure; also pale yellow to gray and brown. Index $n_y = 1·5144$ Na.

Composition, $MgCO_3.Na_2CO_3.NaCl$. Analysis, Pratt.

$CO_2$ 35·43, MgO 16·22, $Na_2O$ 24·90, Cl 14·23, Na 9·22 = 100.

B.B. fuses at 1 with frothing to a white alkaline mass; colors the flame intense yellow. Easily soluble in acids.

Occurs in a clay at a depth of 450 feet at Borax lake, San Bernardino Co., California. Named after Mr. Northup, who first obtained the mineral.

This compound has been formed synthetically by A. de Schulten, Bull. Soc. Min., **19**, 164, 1896.

OCTAHEDRITE, pp. 240, 1043.—Cryst.—Bourg d'Oisans, new form $\sigma$ (11·3·44)?, K. Busz, Zs. Kr., **20**, 557, 1892. Jämtland, Hamberg, G. För. Förh., **16**, 307, 1894. Glacier de la Meije, Hautes Alpes, Lacroix, C. R., **122**, 1429, 1896.

Investigation of crystalline structure, Baumhauer, Zs. Kr., **24**, 555, 1895.

Occurs with brookite at Placerville, Eldorado Co., Cal., Kunz, Am. J. Sc., **43**, 329, 1892. Also at Magnet Cove, Ark., Penfield, Am. J. Sc., **48**, 114, 1894.

See *Halite.*

OLIGOCLASE, p. 322.—Cleavage and parting planes, Penfield, Am. J. Sc., **48**, 115, 1894.

See also *Feldspar.*

ONOFRITE, p. 64.—Occurs with cinnabar at Ouen-Shan-Tchiang, Central China, Termier (anal. by Pisani), Bull. Soc. Min., **20**, 204, 1897.

OPAL, pp. 194, 1038.—Occurrence in New South Wales, Anderson [Rec. G. Surv. N. S. Wales, 3, 29, 1892], Jb. Min., **2**, 221 ref., 1894.

ORPIMENT, pp. 35, 1043.—Obtained in fine crystals in cavities in clay at Mercur, Utah; these are monoclinic (Penfield, priv. contr.) as earlier (1866) deduced for Hungarian crystals by Breithaupt; Groth has also reached this conclusion (Tab. Ueb. Min., 17, 1898; cf. also notes by Hintze, Zs. Kr., **24**, 204, 1894). Miers found nothing in the optical characters at variance with orthorhombic crystallization, Min. Mag., **10**, 204, 1894.

ORTHOCLASE, p. 315.—Vesuvius, measurement of crystals, Franco, Giorn. Min., **5**, 184, 1894.

Crystals from Lapland with (370) as tw. plane, Jeremejev, Vh. Min. Ges., **30**, 463, 1893. Also twin with tw. pl. ⊥ plane *cm*, Goldschmidt and Wright, Zs. Kr., **30**, 300, 1898 (earlier noted by Tschermak, Min. petr. Mitth., **8**, 414, 1887). Sanidine from Monte Cimino, near Viterbo, Italy, Zambonini, Riv. Min. Ital., **20**, 20, 1898.

Noted as a gangue mineral in a fissure vein in the Silver City district, Idaho, Lindgren, Am. J. Sc., **5**, 418, 1898.

See also *Feldspar.*

OTTRELITE, pp. 642, 1043.—Analysis, Liberty, Maryland, Eakins, Bull. U. S. G. Surv., **113**, 111, 1893.

In metamorphic conglomerate in the Green Mts., Vermont, Whittle, Am. J. Sc., **44**, 270, 1892.

See *Chloritoid, Bliabergsite.*

**Paralaurionite.** G. F. Herbert Smith, Min. Mag., **12**, 108, 1899.

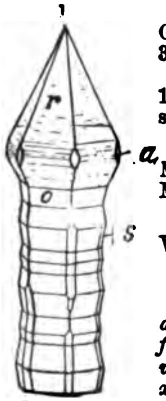
Monoclinic. Forms: *a* (100), *c* (001), *m* (110), *d* (101), $h\,(\bar{2}01)$, $k\,(\bar{4}01)$, $l\,(\bar{6}01)$; *p* (111). Angles[*] *ac* = *62° 47′, *am* = *67° 25′, *ap* = *58° 28′, *cm* = 79° 53′, *cp* = 52° 37½′.

In prismatic (∥ *b*) or tabular (∥ *a*) crystals; twins with *a* as tw. pl. and thus pseudo-orthorhombic. Cleavage, basal. G. = 6·05. Sections ∥ *a* show in monochromatic light a double interference-figure. Refractive index $\beta = 2·1463$.

Composition as for laurionite, PbClOH. Analysis, Cl 14·9, O [3·6], Pb 78·1, $H_2O$ 3·4 = 100. The water is given off at 180°; laurionite loses its water at 142°.

Occurs in lead slags from Laurion, Greece.

1



Parisite.

PARISITE, p. 290.—Crystals (rhombohedral, with new forms) from Igaliko, Greenland, described, also analysis, G. Nordenskiöld, G. För. Förh., **16**, 338, 1894.

Obtained from Ravalli County, Montana, in striated hexagonal crystals (Fig. 1), with pyramidal terminations, embedded in a white siliceous matrix. Analyses, 1, by C. H. Warren; also 2, from Muso, *id.*:

| | G. | $CO_2$ | $Ce_2O_3$ | $(La,Di)_2O_3$ | CaO | F | gangue = | | O = F |
|---|---|---|---|---|---|---|---|---|---|
| Montana, | 4·128 | 22·93 | 26·14 | 28·46 | 10·98 | 5·90 | [8·07] | =102·48 | 2·48 |
| Muso Valley, | 4·302 | 24·22 | 30·67 | 29·74 | 10·70 | 6·82 | 0·50 | =102·65 | 2·87 |

These analyses lead to the formula $[(Ce,La,Di)F]_2Ca(CO_3)_3$. Penfield and Warren, priv. contr.

**Pearceite.** *S. L. Penfield*, Am. J. Sc., **2**, 17, 1896.

Monoclinic. Axes $\grave{a} : \bar{b} : \grave{c} = 1·7309 : 1 : 1·6199$, $\beta$ = *89° 51′. Observed forms: *a* (100), *b* (010), *c* (001); *l* (310), *m* (110), *h* (130); *d* (102), *n* (101), *t* (201), *e* (401), *f* (601), $\Delta\,(\bar{2}03)$, $n_0\,(\bar{1}01)$, $t_0\,(\bar{2}01)$, $e_0\,(\bar{4}01)$, $f_0\,(\bar{6}01)$; *k* (021); *o* (114), *r* (112), *p* (111), *v* (332), *s* (221), *u* (331), $o_0\,(\bar{1}14)$, $q_0\,(\bar{1}13)$, $r_0\,(\bar{1}12)$, $p_0\,(\bar{1}11)$, $v_0\,(\bar{3}32)$, $s_0\,(221)$, $u_0\,(\bar{3}31)$, *x* (311), *y* (313), *z* (3·1·12). Angles: *mm′* $(110 \wedge \bar{1}10)$ = *60° 2′, *cd* = *25° 3′, *cn* = 43° 2′, *cr* = 43° 3′, *cp* = 61° 49′.

In pseudo-rhombohedral crystals, tabular ∥ *c*; basal faces with triangular markings (Fig. 1). Twinning probable as with the micas and chlorites, but not definitely determined; this would explain the occurrence of some of the forms in the list above. Also massive.

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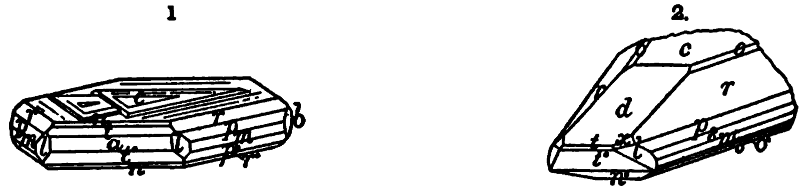
[*] The author gives the axes, $a : \bar{b} : \grave{c} = 0·8811 : 1 : 0·6752$ ($\beta$ = 62° 47′), which, however, do not correspond with the angles quoted.



Figs. 1, 2, Marysvale, Montana.

Cleavage none. Fracture conchoidal. Brittle. H. = 3. G. = 6·125–6·166. Luster metallic. Color and streak black. Opaque.

Composition, $Ag_8AsS_6$ or $9Ag_2S.As_2S_3$, hence an arsenical polybasite. Analyses: 1, F. C. Knight, quoted by Penfield, l. c. 2, S. H. Pearce, Am. J. Sc., 44, 16, 1892, after deducting 28·18 p. c. impurities (siderite, galena). 3, Penfield, l. c., deducting 12·81 p. c. (chiefly galena). Here belongs also an analysis by H. Rose of a Schemnitz mineral (No. 2, Dana Min., p. 146).

| | S | As | Sb | Ag | Cu | Zn |
|---|---|---|---|---|---|---|
| 1. Marysvale, Mont. | 17·71 | 7·39 | — | 55.17 | 18·11 | — Fe 1·05, insol. 0·42 = 99·85 |
| 2. Aspen, Colo. *mass.* | 17·73 | 6·29 | 0·18 | 59·73 | 12·91 | 3·16 = 100 |
| 3. " " *cryst.* | 18·13 | 7·01 | 0·30 | 56·90 | 14·85 | 2·81 = 100 |

B.B. decrepitates slightly and fuses readily. On charcoal in O.F. a slight arsenical coating; with soda a silver globule. In the open tube fumes of sulphur dioxide and sublimate of arsenic trioxide. In the closed tube fuses, gives a yellow sublimate of arsenic trisulphide and above a faint deposit of sulphur. Readily oxidized and dissolved in powder by nitric acid.

Occurs with quartz and calcite, also chalcopyrite, in a cavity at the Drumlummon mine, Marysvale, Montana. Also at the Mollie Gibson mine, Aspen, Colorado, both massive in large quantity disseminated through a pink barite; also in tabular crystals embedded in siderite, in both cases associated with galena. Also in good crystals from the Tintic district, Utah.

Named after Dr. Richard Pearce of Denver.

Pectolite, p. 373.—Torosay in Mull, Scotland, analyses, Heddle, Trans. G. Soc. Glasgow, 241, 1892.

**Pelionite.** A name suggested by W. F. Petterd for a bituminous coal (Pelion Coal) resembling the English cannel coal, from near Monte Pelion, Tasmania. Catalogue of Minerals of Tasmania, 1893.

Pencatite, p. 271.—Investigated (also predazzite), Leneček, Min. petr. Mitth., 12, 429, 447, 1892.

**Penfieldite.** *F. A. Genth*, Am. J. Sc., 44, 260, 1892. *S. L. Penfield*, *ibid.*, 48, 114, 1894.

Hexagonal. Axis $\dot{c} = 0·8967$; $0001 \wedge 01\bar{1}1 = 39° \; 26\tfrac{1}{4}'$. In hexagonal prisms (Fig. 1) with *c* (0001), *m* ($10\bar{1}0$) and *p* (1122); also undetermined acute pyramids of the unit series forming tapering crystals. Angle *cp* = *41° 58′.

Cleavage: basal, distinct. Luster vitreous, inclining to greasy. Color white. Transparent to translucent. Double refraction, strong, positive.

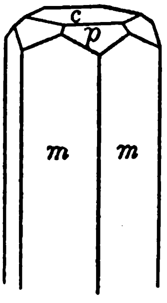
Composition, a lead oxychloride, $PbO.2PbCl_2$ = Chlorine 18·2, lead 79·7, oxygen 2·1 = 100. Analysis, Genth:

| | Cl | Pb |
|---|---|---|
| 1. *Tapering cryst.* | 18·55 | 78·25 |
| 2. *Opaque cryst.* | 17·94 | *undet.* |

B.B. in the closed tube decrepitates and yields a sublimate of lead chloride but no water. Easily soluble in nitric acid.

Found in the ancient lead slags from Laurion, Greece, in which it has resulted from the action of sea-water. Other lead oxychlorides occuring at Laurion are: laurionite, fiedlerite and paralaurionite (this Append., p. 50).

1.



Penfieldite.

Penninite, p. 650.—Analysis of kämmererite, from Tampadel, Zobtengebirge, Lower Silesia, Traube, Zs. G. Ges., 48, 58, 1894.

See *Clinochlore*.

**Pentlandite**, p 65.—Shown by Penfield (Am. J. Sc., 45, 493, 1893) to occur intimately mixed with pyrrhotite at Sudbury, Ontario. It is non-magnetic, has a lighter color and is isometric as shown by the octahedral parting. G. = 4·946–5·006. Analysis gave S: 33·42, Fe 30·25, Ni 34·23, Co 0·85, gangue 0·67 = 99·42. It is also shown that the *folgerite* of Emmens (ref., p. 26) from the Worthington mine, 30 miles southwest of Sudbury, is only pentlandite.

Occurs at Beiern, Norway, (analysis), J. H. L. Vogt, G. För. Förh., 14, 325, 1892.

See also *Heazlewoodite*.

**Percylite**, pp. 172, 1028.—Synthetic experiments by C. Friedel lead to the composition before suggested for the species, viz. $PbCuCl_2(OH)_2$ or $Pb(OH)Cl.Cu(OH)Cl$. This is the composition of boléite (Min., p. 1028) except that it contains a small amount of silver chloride (⅓AgCl). Bull. Soc. Min., 15, 96, 1892. Friedel has also obtained crystals with the latter composition (boléite), *ibid*., 17, 6, 1894.

The locality at Boléo, Lower California has yielded not only the cubes of boléite to which belong the formula $PbCuCl_2(OH)_2 + ⅓AgCl$ (see Min., p. 1028, and Mallard and Cumenge, Bull. Soc. Min., 14, 283, 1891), but also octahedral or pyramidal crystals, sometimes in pseudo-isometric groupings of six crystals. They are referred to the tetragonal system by Cumenge, C. R., 116, 898, 1893. Analyses, 1, Fourment, quoted by Cumenge; 2, Friedel, Bull. Soc. Min., 16, 187, 1893.

| | G. | Cl | Pb | Cu | Ag | $H_2O$ | O |
|---|---|---|---|---|---|---|---|
| 1. | 4·675 | 18·53 | 52·99 | 15·20 | 0·15 | 9·00 | 4·13 = 100 |
| 2. | 4·71 | 19·04 | 52·85 | 17·95 | — | 5·44* | 4·55 $SiO_2$ 0·39 = 100·26 |

* Ignition.

Analysis 2 (1 being incorrect in the $H_2O$) corresponds to $PbCuCl_2(OH)_2$, the composition above given for percylite. These crystals are called *cumengéite* by Mallard, Bull. Soc. Min., 16, 184, 1893. He obtained 001 ∧ 101 = 58° 44′; ċ = 1·6469; optically negative, uniaxial; indices $\omega = 2·026$, $\epsilon = 1·965$, $\omega - \epsilon = 0·061$.

The relation of percylite to boléite and cumengite has also been discussed by Lacroix (Bull. Mus. d'Hist, Nat., Paris, p. 39, 1895), but his conclusions rest on insufficient data. He would recognize a series passing from cumengite containing no silver ($PbCuCl_2(OH)_2$, through *pseudoboléite* with less than ⅓AgCl and boléite with ⅓AgCl, to percylite in which still more AgCl is present (but see Friedel above). He would also find a progressive increase in specific gravity, viz. for the four substances named: 4·71, ≯ 5 08, 5·08, 5·254; also a decreasing birefringence, viz. 0·061 (cumengite), 0·03, (pseudoboléite), 0·01 (boléite), to 0 or nearly 0 in percylite. The substance called *pseudoboléite* forms part at least of the cubic crystals with re-entrant angles (001 ∧ 102 = 63° 44′) referred to cumengite and percylite by Mallard.

A mineral from the Broken Hill mines, New South Wales, is referred to boléite by Liversidge, Proc. R. Soc. N. S. W., 28, 94, 1894. In cubic crystals with *o* and *d*. H. = 3·5. G. = 5·02, Analysis by Carmichael and Armstrong: Cl 13·50, Pb 47·20, Cu 19·20, Ag 8·25, O calc. [6·10]. $H_2O$ calc. [5·44] = 99·69. $H_2O$ determined by Liversidge 6·39 p. c.

Obviously these supposed distinct minerals need further examination, especially on the chemical side.

**Periclase**, p. 207.—Occurs in small grains at Långban, Hj. Sjögren, G. För. Förh, 17, 288, 1895.

Discussion of method of origin at Långban and Nordmark, Hj. Sjögren, G. För. Förh., 20, 25, 1898.

Artificial production, A. de Schulten, Bull. Soc. Min., 21, 87, 1898.

**Perovskite**, p. 722.—Further investigation of crystallographic and optical characters, Des Cloizeaux Bull. Soc. Min., 16, 218, 1893.

Occurs with magnetite as a rock at Catalão, Goyaz, Brazil, Hussak, Jb. Min., 2, 297, 1894.

**Petalite**, p. 311.—Occurs near the source of the Amanaur river, Caucasus, C. Jeremejev (anal., Antipov), Bull. Ac. St. Pet., 5, 1896, Proc. Verb., p. viii.

**Petzite**, p. 48.—Occurs in the Yale district, Br. Columbia, Hoffmann, Rep. G. Canada, 8, 12R, 1895. Also at the Nordenfeldt mine, Thames gold-field, New Zealand, J. Park, Austr. Assoc. Adv. Sci., 3, 152, 1891.

**Pharmacolite**, p. 827.—Analysis by Church gives 12·37 p. c. as loss of water *in vacuo* ($3 = H_2O$), and 3·11 between 100° and 200° ($H_2O$). Min. Mag., 11, 7, 1895.

**Phenacite**, p. 462.—Crystals described (anal. by Preis) from Ober-Neusattel, Vrba, Zs. Kr., 24, 119, 1894.

Crystals occur at Kragerö of prismatic habit, the usually tri-rhombohedral symmetry not distinctly shown, twins of both contact and penetration types, with *m* (10$\bar{1}$0) as tw. plane, Bäckström, G. För. Förh., **20**, 295, 1898, and Zs. Kr., **30**, 352, 1898.

Pseudomorphous crystals (Fig. 1) of very large size (one weighed 28 lbs.) occur at Greenwood, Me., C. H. Warren, Am. J. Sc., **6**, 119, 1898.

Occurrence at St. Christophe-en-Oisans, Dauphiné, Des Cloizeaux and Lacroix, C. R., **116**, 1281, 1893. Also at Striegau, Silesia, Hintze, Zs. Kr., **28**, 174, 1897.

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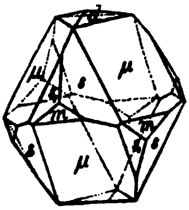


Phenacite.

**Philipstadite.** *R. A. Daly*, Proc. Amer. Acad. Sc., **34**, 433, 1899.—See *Amphibole.*

Phillipsite, p. 579.—Analysis by G. H. Edwards of crystals from Bass Strait, Australia, gave:

| G. | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | (Ba,Sr)O | CaO | $Na_2O$ | $K_2O$ |
|---|---|---|---|---|---|---|---|
| 2·20 | 47·94 | 21·72 | 4·44 | 0·77 | 2·25 | 2·73 | 9·87 = 100·65 |

This leads to the formula $RAl_2Si_4O_{12}.4H_2O$, where R = $K_2$, $Na_2$ and Ca. That phillipsite should contain $4H_2O$, instead of $4\frac{1}{2}H_2O$ as generally accepted (Min., p. 580), was indicated by Pratt and Foote in their discussion (Am. J. Sc., **3**, 448, 1897) of the wellsite-phillipsite-harmotome-stilbite series. S. L. Penfield, priv. contr.—See *Wellsite.*

Phlogopite.—See *Mica.*

Phœnicochroite, p. 914.—Synthesis, Ludeking, Am. J. Sc., **44**, 57, 1892. Also Lachaud and Lepierre, Bull. Soc. Chim., **6**, 232, 1891.

Phosgenite, p. 292.—Crystals from Monteponi, Sardinia, studied by Goldschmidt, are referred to the trapezohedral group of the tetragonal system, Zs. Kr., **21**, 321, 1893; **23**, 139, 1894; **26**, 9, 1896. Traube concludes, however, that etching-figures are not at variance with crystallization in the normal (holohedral) group, Jb. Min., Beil.-Bd., **10**, 456, 1896. On crystals from Laurion, Greece, G. F. Herbert Smith, Min. Mag., **12**, 107, 1899.

Formation of artificial crystals also of $PbCO_3.PbBr_2$, A. de Schulten, Bull. Soc. Min., **20**, 191, 194, 1897.

Picromerite, p. 948.—(Schoenite.) Relation to other sulphates, etc., J. K. van der Heide, Zs. phys. Ch., **12**, 416, 1893.

Piedmontite, p. 521.—Shown by G. H. Williams to occur at South Mountain, Pa., in an ancient rhyolite with scheelite, etc.; analysis by W. F. Hillebrand, after deducting quartz assumed to be present to the amount of 10 p. c.: $SiO_2$ 37·37, $Al_2O_3$ 22·07, $Ce_2O_3$ 0·89, $R_2O_3$* 1·52, $Fe_2O_3$ 4·78, $Mn_2O_3$ 8·15, MnO 2·285, CaO 18·825, MgO 0·30, $K_2O$ 0·81, $Na_2O$ 0·27, $H_2O$ 2·48, CuO 0·18, PbO 0·17 = 100·05. (* Other rare earths.) Am. J. Sc., **46**, 50, 1893.

Occurs in rhyolite in Province of Shinano, Japan, Yamasaki, J. Coll. Sc. Japan, **9**, 117, 1897.

Pinakiolite, p. 877.—A related mineral from Långban has been analyzed by Bäckström, G. För. Förh, **17**, 257, 1895.

Pinite, p. 621.—Breage, Cornwall, analysis, Collins, Min. Mag., **10**, 8, 1892.

**Pirssonite.** *J. H. Pratt*, Am. J. Sc., **2**, 126, 1896.

Orthorhombic-hemimorphic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·5662 : 1 : 0·3019. Forms: *b* (010), *m* (110), *p* (111), $p_1$ (11$\bar{1}$), *s* (131), *x* (311). Angles: *mm'''* = *59° 2′, *pp''* = *63° 0′, *pp'* = 54° 6′, *pp'''* = 29° 50′. Habit prismatic (Figs. 1 to 4).

Cleavage none. Fracture conchoidal. Brittle. H. = 3–3·5. G. = 2·352. Luster vitreous. Colorless to white, sometimes dark from impurities. Pyroelectric. Optically +. Ax. pl. ∥ *c*. $Bx_a \perp b$. $2E_y$ = 48° 14′. Indices (Na): $\alpha$ = 1·5043, $\beta$ = 1·5095, $\gamma$ = 1·5751 (∴ 2V = 32° 48′).

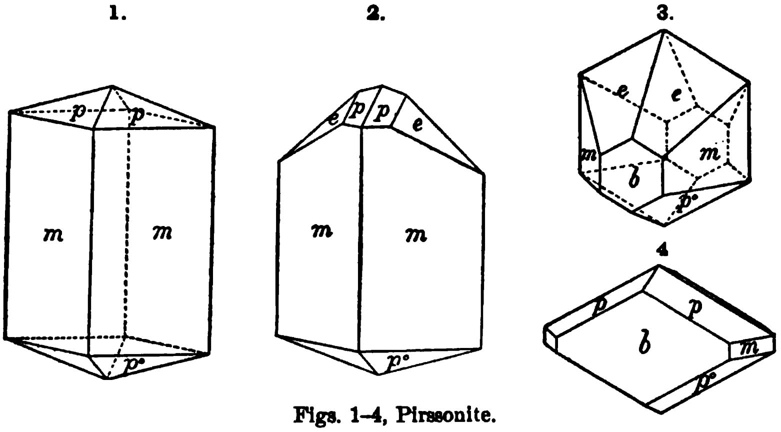
Composition, $CaCO_3.Na_2CO_3.2H_2O$. Analysis:

| | $CO_2$ | CaO | $Na_2O$ | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|
| ½ | 36·07 | 23·38 | 25·70 | 0·15 | 14·73 $Al_2O_3$,$SiO_2$ 0·32 = 100·45 |

B.B. decrepitates, fuses at 2–2·5, coloring the flame deep yellow; alkaline reaction after heating. Soluble in cold acids with effervescence.

Occurs sparingly with gay-lussite and northupite at a boring near Borax lake, San Bernardino Co., California. Named after Prof. L. V. Pirsson of New Haven.

This mineral has been obtained artificially by A. de Schulten, C. R., **123**, 1023, 1896.



Figs. 1–4, Pirssonite.

**Plagioclase.**—See *Feldpar.*

**Plagionite**, p. 118.—Description of crystals from Wolfsberg, Luedecke, Min. d. Harzes, 125, 1896; also with new forms, L. J. Spencer, Min. Mag., **11**, 192, 1897, and **12**, 56, 1899 (see further *Semseyite*).

**Planoferrite.** *L. Darapsky*, Zs. Kr., **29**, 213, 1897.

In rhombic or hexagonal tabular crystals (probably orthorhombic) with basal cleavage and faces on the edges. Brittle. H. = 3. Color yellowish green to brown (Grünling) streak chrome-yellow. Composition $Fe_2O_3.SO_3.15H_2O$. Analysis:

$SO_3$ 15·57, $Fe_2O_3$ 31·20, $H_2O$ 51·82, insol. 1·41 = 100.

Occurs in druses in copiapite at the Lautaro mine near Morro Moreno, Antofagasta, Atacama.

**Platinum**, pp. 25, 1044.—Venable concludes that the reported occurrence of platinum in North Carolina is very doubtful, Am. J. Sc., **43**, 540, 1882; J. Elisha Mitchell Sc. Soc., **8**, 1892. Occurs with gold in the sand of the N. Saskatchewan river, near Edmonton, Alberta, Hoffmann, Rep. G. Canada, **5**, 65R, 1889–90. Also on Rock creek, Kettle river, Yale district, Br. Columbia, *ib.*, **6**, 14R.

**Plattnerite**, p. 239.—Mullan, Idaho, analysis (Yeates) and cryst. description (Ayres) as given in Syst. Min., p. 240. Am. J. Sc., **43**, 407, 1892.

**Plumbocuprite.**—See *Cuproplumbite.*

**Plumboferrite**, p. 228.—Sjö mine, Örebro, Sweden, analysis of impure material, Igelström, G. För. Förh., **16**, 594, 1894, and Zs. Kr., **24**, 129, 1894.

**Polianite**, p. 236.—Analyses, Gorgeu, Bull. Soc. Min., **16**, 96, 1893.

**Pollucite**, pp. 348, 1044.—Rumford, Me., analysis by H. W. Foote confirming formula of Wells, Am. J. Sc., **1**, 457, 1896.

| | $SiO_2$ | $Al_2O_3$ | $Cs_2O$ | $K_2O$ | $Na_2O$ | $Li_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| G. = 2·984 ¦ | 43·64 | 16·84 | 36·14 | 0·37 | 2·09 | 0·08 | 1·58 = 100·74. |

**Polybasite**, pp. 146, 1045.—Crystals from the Yankee Boy mine, Ouray, Colorado, are shown by Penfield to be monoclinic and pseudo-rhombohedral (Fig. 1). Axes: $\grave{a} : \bar{b} : \dot{c}$ = 1·7309 : 1 : 1·5796, $\beta$ = 90° 0′. Forms: *c* (001), *l* (310), *m* (110), *n* (101), $\Delta$ ($\bar{2}03$), $n_0$ ($\bar{1}01$), $\pi$ ($\bar{4}03$), $t_0$ (201); *o* (114), *r* (112), *p* (111), *s* (221), *u* (331)?, $o_0$ ($\bar{1}14$), $r_0$ ($\bar{1}12$), $p_0$ ($\bar{1}12$). Angles *cm* = *90° 0′, *mm′* = *60° 2′, *cn* = *42° 23′, *cr* = 42° 22′, *co* = 24° 31′. Crystals tabular

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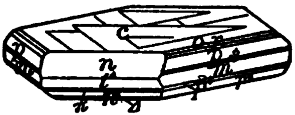
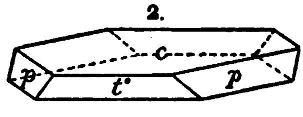


Colorado.

2.



Freiberg.

l. c., Figs. 1, 2. The form is very near that of *pearceite*, p. 50, Fig. 2 shows a crystal from the Himmelfahrt mine, Freiberg, perhaps a twin. Am. J. Sc., **2**, 23, 1896. See also *Pearceite*. Also occurs in fine crystals at the Big Seven Mine, Neihart, Montana (Pfd.).

Analysis from Quespisiza, Chili, by Bodländer: S 16·37, Sb 5·15, As 3·88, Ag 67·95, Cu 6·07, Pb 0·76 = 100·18. This gives the ratio of $Ag_2(Cu_2)S : Sb_2(As_2)S_3 = 7·74 : 1$ instead of 9 : 1 as commonly accepted, Jb. Min., **1**, 98, 1895.

Polycrase, p. 744.—Occurs in the township of Calvin, Nipissing, Ontario, Canada, Hoffmann, Am. J. Sc., **7**, 243, 1899.

Polylite, p. 1045.—Thomson's supposed mineral is shown to be a mixture containing fayalite derived from an iron furnace, Lacroix, Bull. Soc. Min., **20**, 308, 1897.

Powellite, p. 989.—Occurs at the South Hecla copper mine, Houghton Co., Michigan, ($WO_3$ 1·65 and 4·50 p. c.,) Koenig and Hubbard, Am. J. Sc., **46**, 356, 1893. The same locality has afforded some fine crystals described by C. Palache, *ibid.*, **7**, 367, 1899. G. = 4·356, color bluish green. Habit as in Fig. 1. Observed forms: *e* (101), *p* (111), *h* (133), *j* (3·11·11); also narrow and doubtful, *k* (155), *l* (1·11·11). Angles near those of scheelite. Cleavage *e* interrupted. One specimen showed a dark, nearly black exterior and bluish-green interior presumably due to variation in composition.

Crystals, with *c* (001), *e* (101), *p* (111), have been obtained artificially by L. Michel; analysis gave $MoO_3$ 62·37, $WO_3$ 10·23, CaO 26·41 = 99·01. Bull. Soc. Min., **17**, 612, 1894.

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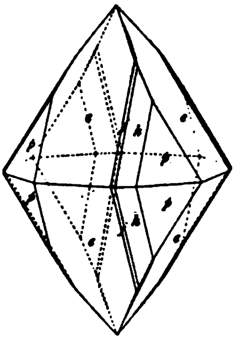

Powellite.

Prehnite, p. 530.—Occurs in crystals at Friedensdorf near Marburg, Brauns (anal. by A. Nau), Jb. Min., **2**, 6, 1892.

Crystals described and investigated pyroelectrically; new forms (301), (601), (10·0·1); crystals hemimorphic and twinned (tw. pl. *a* (100)). Traube, Jb. Min., Beil.-Bd., **9**, 134, 1894.

Crystals described from Tulferthal, Tyrol, Habert, Zs. Kr., **28**, 258, 1897. Anal., Fassa, Tyrol, Schneider, Bull. U. S. G. Surv., **113**, 112, 1898.

Identification in rocks, Lacroix, Bull. Soc. Min., **21**, 277, 1898.

**Prolectite.** *Hj. Sjögren*, Bull. G. Inst. Upsala, **1**, 40, 1892; **2**, 99, 1894.

A new member of the Humite Group, thus far only known from two fragments of crystals obtained with humite, chondrodite, and clinohumite at the Ko mine at Nordmark, Sweden. In appearance and physical characters like other members of the group. Crystallization, monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1·0803 : 1 : 1·8862$, $\beta = 90°$. Forms: (001), (010); (110); (103), (503), $(\bar{4}09)$; (012), (011); (121), (367), (362); $(\bar{2}27)$, $(\bar{2}23)$, $(\bar{1}11)$; $(\bar{1}21)$, $(\bar{2}49)$. Ax. plane ($\mathfrak{a} = Bx_o$) inclined 44° to 47° 15′ to (001), that is, 46° to 42° 45′ to $\dot{c}$. $2K_{a.y} = 79° 45'$ ($n_y = 1·6708$).

Not yet analyzed, but the composition is probably $Mg[Mg(F,OH)]SiO_4$, the member of the group predicted by Penfield and Howe as noted under the *Humite Group*, p. 85. Hence named from *προλέγειν*, to foretell.

Prosopite, p. 178.—Analysis of a pale green variety from Utah, Hillebrand, Am. J. Sc., **7**, 53, 1899.

**Pseudoboléite.** *A. Lacroix*, Bull. Mus. d'Hist. Nat. Paris, p. 39, 1895.—See *Percylite*.

Pseudobrookite, p. 232.—Crystals from Aranyer Berg have been examined by Traube, Zs. Kr., **20**, 327, 1892. Doss has described crystals obtained as a furnace product, *ibid.*, p. 566. He deduced the composition $Fe_2O_3.TiO_2$ and urges isomorphism with andalusite; Frenzel, however, has confirmed the accepted formula, $2Fe_2O_3.3TiO_2$, Min. petr. Mitth., **14**, 126, 1894.

Pseudogaylussite.—Discussion as to the origin of the barley-corn pseudomorphs of calcium carbonate (see Min., pp. 907, 271) with description of forms occurring in Holland, F. J. P. van Calker, Zs. Kr., **28**, 556, 1897.—See also *Jarrowite*.

Pseudomalachite, p. 794.—Analysis of *ehlite*, from Semipalatinsk, Antipov, Vh. Min. Ges., **28**, 527, 1891.

**Pseudopyrophyllite.** *F. Loewinson-Lessing*, Vh. Min. Ges., **33**, 283, 1895. Zs. Kr., **28**, 516. —See *Pyrophyllite*.

Ptilolite, p. 572.—A new locality near Silver Cliff, Custer Co., Colorado, is described by Cross and Eakins, Am. J. Sc., **44**, 96, 1892. Occurrence similar to that of Green Mountain. Analysis, Eakins: $SiO_2$ 67·83, $Al_2O_3$ 11·44, CaO 3·30, $K_2O$ 0·64, $Na_2O$ 2·63, $H_2O$ 13·44 = 99·28. The relation in composition between ptilolite and mordenite is discussed by Clarke, *ibid.*, p. 101.

PYRARGYRITE, p. 131.—Crystals from Mexico with new form $(11\bar{2}6)$, Busz, Zs. Kr., **20**, 557, 1892. From the Harz described by Luedecke, Min. d. Harzes, 134, 1896.

Occurs in galena near Bear Lake, West Kootanie, Br. Columbia, Hoffmann, Rep. G. Canada, **6**, 27R, 1892–93.

PYRITE, pp. 84, 1045.—Crystals described from Bélabánya, Hungary; new forms (11·5·0), (13·8·0), (13·9·0), (10·7·0), (15·11·0), (8·13·0), (7·11·0), (11·15·0), (16·9·1). A. Franzenau, Ber. aus Ungarn, **15**, 198, 1898. Also from Kotterbach, with new forms $(21\cdot\bar{1}\cdot0)$, (17·1·0), etc., Zimanyi, Földt. Közl., **28**, 192, 1898.

Monte della Riva, Valle del Dardagna, description of peculiar crystals, Bombicci, Mem. Accad. Sci. Bologna, Jan. 8, 1893.

A twinning of tetartohedral crystals (similar to ullmannite) is suggested by Miers for a specimen from Gilpin Co., Colorado, Min. Mag., **12**, 112, 1899.

Twin crystal with (320) as tw. plane, G. D'Achiardi, Att. Soc. Tosc., Proc. verb., March 14, 1897.

From Müsen, containing 4·18 Ni and 1·97 Co, Laspeyres, Zs. Kr., **20**, 553, 1892. Also from Sudbury, Ont., (Murray mine,) containing 4·34 p. c. Ni, Walker, Am. J. Sc., **47**, 312, 1894.

Action of alkaline reagents on pyrite compared with that on marcasite, Doelter, Jb. Min., **2**, 273, 1894. The same subject has been fully studied by A. P. Brown, Proc. Am. Phil. Soc., 33, June 19, 1894.

Penfield has shown that the uncertain *blueite* and *whartonite* of Emmens (J. Am. Ch. Soc., **14**, No. 7, 1892), both from the Sudbury region, are (even if the analyses are trustworthy) only nickeliferous varieties of pyrite. Am. J. Sc., **45**, 496, 1893.

PYROAURITE, p. 256.—Described by Hj. Sjögren from the Moss mine, Norway. Occurs in hexagonal or rounded tabular crystals (Fig. 1). Forms: *c* (0001), *m* $(10\bar{1}0)$, *h* $(21\bar{3}0)$, *f* $(10\bar{1}1)$; *cf** = 76° 30′, hence $\dot{c} = 3\cdot6073$. Crystals apparently show pyramidal hemihedrism in the development of *h*. H. = 2–3. G. = 2·07. Luster pearly to greasy. Color yellow to yellowish brown. Translucent. Optically – ; birefringence low. Analysis (on 0·03 gr.) by R. Mauzelius: $Fe_2O_3$ 22·0, MnO 4·5, MgO 34·8, $H_2O$ 36·1, insol. 0·5 = 97·9. Associated with pyrochroite (often altered to manganite) in manganiferous dolomite. Bull. G. Inst. Upsala, **2**, 59, 1895.

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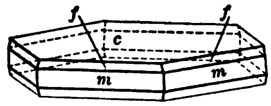

PYROCHLORE, p. 726.—From Alnö, analyses and discussion of composition (also of related minerals), Holmquist, G. För. Förh., **15**, 588, 1893. From the Ural, analysis, Khrushchov, Vh. Min. Ges., **31**, 415, 1894.

PYROLUSITE, pp. 243, 1045.—Analyses, Gorgeu, Bull. Soc. Min., **16**, 96, 1893.

PYROMORPHITE, p. 770.—Crystals from New Caledonia with new forms $(15\cdot0\cdot\bar{15}\cdot4)$, $(90\bar{9}1)$. Lacroix, C. R., **118**, 553, 1894, and Bull. Soc. Min., **17**, 120, 1894.

Crystals described from Nil-Saint-Vincent, Belgium, G. Cesàro, Mem. Acad. Belg., **53**, 1897.

PYROPHYLLITE, p. 691.—F. Loewinson-Lessing concludes from his investigations of the mineral of Pyshminsk that it represents a mixture of pyrophyllite, $3H_2O.3Al_2O_3.11SiO_2$, and *pseudo-pyrophyllite*, $3MgO.4Al_2O_3.9SiO_2.8H_2O$. These were separated by the Thoulet solution. Both are assumed to be orthorhombic with $Bx_a \perp$ base (cleavage); the former is optically negative, the latter positive. Vh. Min. Ges., **33**, 283, 1895, and Zs. Kr., **28**, 516, 1897.

PYROSTILPNITE, p. 135.—Discussion of crystalline form, Luedecke, Min. d. Harzes, 133, 1896.

PYROXENE, pp. 352, 1045.—Crystals from New York State described, with optical investigation and analyses, H. Ries, Ann. N. Y. Acad. Sc., **9**, 124, 1896.

*Diopside*, Achmatovsk, new form *H* (551), Busz, Zs. Kr., **20**, 558, 1892. Crystals from several localities described, also *augite*, new forms 𝔉 (10·1·0), 𝔊 (710), ℌ (750), 𝔎 (140), 𝔐 (160), 𝔑 (0·11·5), 𝔖 $(\bar{4}14)$, 𝔙 $(\bar{4}21)$, 𝔚 $(\bar{5}31)$, A. Schmidt, Zs. Kr. **21**, 1, 1892. From Graubünden, Baumhauer, *ibid.*, p. 200. From Zöptau, optical and chemical description, Graber, Min. petr. Mitth., **14**, 265, 1894.

Forms a saccharoidal rock of an azure-blue color, on the Gila river, 40 miles from Silver City, New Mexico. Analysis by Merrill and Packard gave: $SiO_2$ 54·30, MgO 18·33, CaO 25·00, FeO 1·11 = 98·74. Am. J. Sc., **43**, 279, 1892.

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* The author gives $10\bar{1}0 \wedge 10\bar{1}1 = 76° 30$.

*Violan*, p. 357.—Analysis of original material by Penfield shows it to be essentially a diopside, Am. J. Sc., **46**, 293, 1893. Color light blue. G. = 3·237–3·272.

| $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | $Mn_2O_3$ | $MnO$ | $MgO$ | $CaO$ | $Na_2O$ | $K_2O$ | ign. |
|---|---|---|---|---|---|---|---|---|---|
| 53·94 | 1·00 | 0·86 | 0·88 | 0·36 | 16·63 | 23·80 | 1·22 | 0·05 | 0 66 = 99·40 |

*Salite*, from Sala, optical exam. and analysis, Hovey, Min. petr. Mitth., **13**, 218, 1892.

*Hedenbergite*, Su Poru, Sardinia, analysis by Fasolo, quoted by Lovisato (10·92 p. c. MnO and no $Al_2O_3$); also epidote, etc., Rend. Accad. Linc., **4** (1), 111, 1895. From Renfrew Co., Ontario, optical characters, analysis, etc., Wülfing, Min. petr. Mitth., **15**, 29, 1895.

*Iron-schefferite*, Långban, analysis by Mauzelius, Hj. Sjögren, G. För. Förh., **14**, 251, 1892. See *Urbanite*.

*Jeffersonite*, from Franklin Furnace, N. J., analyzed by Hillebrand, Am. J. Sc., **7**, 55, 1899.

*Augite*, on crystals, see diopside above.

Analysis, Italian Peak, Gunnison Co., Colo., Eakins, Bull. U. S. G. Surv., **113**, 112, 1893. From Highwood Mts., Montana, L. V. Pirsson, Bull. G. Soc. Am., **6**, 410, 1895. In analcite-basalt, Colorado, Hillebrand, quoted by Cross, J. Geol., **5**, 687. 1897.

On the pyroxene (ægirite-augite, augite) from the volcanic rocks (leucitite, etc.) of the Ernici, Province of Rome, Italy, see Viola, Jb. Min., **1**, 101 *et seq.*, 1899. Crystals often show zonal structure with varying extinction; twins noted with *m* (110) as tw. plane. The name *federovite* is suggested by Viola for a pyroxene from this region, which falls between ægirite-augite and ægirite, containing 9 to 13 p. c. alkalies and about 24 p. c. FeO; pleochroism strong, $\mathfrak{c}$ yellow, $\mathfrak{b} = \mathfrak{a}$ olive-green; $\mathfrak{c} \wedge \dot{c} = 65^\circ$ to $75^\circ$, $2V < 50^\circ$.

On the extinction-angles in the vertical zone, see R. A. Daly, Proc. Amer. Acad., **34**, 311, 1899; also the same on etching-figures, *ibid.*, p. 374.

Many petrographical papers (in Jb. Min. *et al.*) contain analyses, optical determinations, etc.; a summary of some of these is given by Viola, Jb. Min., **1**, 115–120, 1899.

Conditions of formation in a magma, Morozewicz, Min. petr. Mitth., **18**, 113, 1898.

The meteorite of Vaca Muerta, Sierra de Chico, contains an unidentified silicate, in some respects resembling augite. Weinschenk, Min. petr. Mitth., **17**, 567, 1897.

PYRRHARSENITE, p. 758.—See *Berzeliite*.

PYRRHOTITE, p. 73.—Crystals from Andreasberg, described with *t* (10$\bar{1}$2), *r* (70$\bar{7}$1), Busz, Jb. Min., **1**, 124, 1895. From Frontenac Co., Canada, with (20$\bar{2}$1), (40$\bar{4}$1), etc., W. Nicol, Zs. Kr., **31**, 53, 1899.

Investigation of magnetic properties, Abt, Wied. Ann., **57**, 135, 1896.

From Sudbury, Ont., containing nickel, Vogt, G. För. Förh., **14**, 315, 1892.

Linck shows reason for not regarding pyrrhotite and troilite as heteromorphic modifications of the same compound (FeS), Ber. Ch. Ges., **32**, 895, 1899.

QUARTZ, pp. 183, 1046.—**Cryst.**—Monograph for crystals from Val Malenco, Rossignoli, Riv. Min. Ital., **10**, 3, 1892. No. Carolina, A. Capen Gill, Inaug. Diss., Leipzig, 1893, reproduced in Zs. Kr., **22**, 97, 1893; also H. A. Miers, Am. J. Sc., **46**, 420, 1893. Jämtland, Hamberg, G. För. Förh., **16**, 307. 1894. Wurmthal, Harz, cryst. described, Luedecke, Abh. Nat. Ges. Halle, **20**, 1894; Min. d. Harzes, 196, 1896. Devil's Lake, Wisconsin, Hobbs, Bull. Univ. Wisconsin, **1**, 109, 1895. Switzerland, Termier, Bull. Soc. Min., **18**, 443, 1895, and C. R., **121**. 842, 1895. Nil-St.-Vincent, Butgenbach, Ann. Soc. G. Belg., **24**, 11, 1897. Pisek, Bohemia, Heberdey, Zs. Kr., **26**, 267, 1896. Tuscany, G. D'Achiardi, Att. Soc. Tosc., Mem., **17**, 1898.

Crystalline structure of pyrogene quartz, Rinne, Jb. Min. **1**, 1, 1892. Lamellar structure shown to be of secondary origin, also effect on optical character, Judd, Min. Mag., **10**, 123, 1893.

Mechanical deformation of crystals from Pitourles-en-Lordat, Ariège, Lacroix, Bull. Soc. Min., **14**, 306, 1891. Discussion of curved and twisted complex crystals and groups from Switzerland, G. Tschermak, Ber. Ak. Wien, Denkschr., July 12, 1894. Also from Cararra, Bombicci, Mem. Accad. Bologna, **2**, 1892.

Inclusions in quartz of Stromboli lava, H. Johnston-Lavis, Soc. G. Ital., April 1, 1894.

Dichroism for infra-red waves, E. Merritt, Wied. Ann., **55**, 49, 1895.

Rotatory power at low temperatures (to − 71·5°), Soret and Guye, Bibl. Univ., **29**, 242, 1892. Rotatory polarization for infra-red waves, Carvallo, Ann. Ch. Phys., **26**, 113, 1892, and C. R., **114**, 288, 1892. Rotatory power and double refraction, Beaulard, J. Phys., **2**, 393, 1893; effect of pressure on optical phenomena, *id.*, *ibid.*, pp. 459, 472; see also Wiechmann, Sch. Mines Q., **20**, 267, 1899. Measurement of rotatory power, Gumlich, Zs. Instrumentenkunde, **16**, 97, 1896. Tenacity investigated, Sella and Voigt, Wied. Ann., **48**, 663, 1893.

Piezo-electric property discussed, Lord Kelvin, Phil. Mag., **36**, 331, 1894.

Refractive indices measured, Wülfing, Min. petr. Mitth., **15**, 59, 1895.

Investigation of coloring matter of smoky quartz (titanium), Weinschenk, Zs. G. Ges., **48**, 704, 1896; Zs. anorg. Ch., **12**, 375, 1896.

Observations on the solvent power of water at elevated temperatures (158° to 323°) and after long duration, G. Spezia, Att. Accad. Sc. Torino, 33, June 16, 1898; also *ibid.*, 31, Dec. 29, 1895. Stated to occur in the Toluca meteoric iron, Laspeyres, Zs. Kr., **24**, 485, 1895.

A supposed cubic form of silica from Guanabacoa, Cuba, has been called *cubaite* by F. Vidal y Careta [Cron. Cient. Barcelona, 13, 497, 1890]; shown by L. F. Navarro to be rhombohedrons of ordinary quartz, Anal. Soc Españ. Hist. Nat., **21**, Actas p. 120, 1893. Later (*ibid.*, **14**, 268, 1891) the first author proposed to substitute the name *guanabaquite* (*guanabacoite*); this includes also pseudomorphous chalcedony (analogous to that from Hungary) as further shown by Navarro, l. c.

**Quartzine. Lutécine, Lutecite.** *Michel-Lévy* and *Munier-Chalmas*, C. R., **110**, 649, 1892, and Bull. Soc. Min., **15**, 159, 1892. *Wallerant*, Bull. Soc. Min., **20**, 52, 1897.

The forms of anhydrous silica having a fibrous structure differ from quartz in slightly lower density (G. = 2·5–2 6) and more distinctly in optical characters. They are optically +, but *biaxial* with a small axial angle, 20° to 35°; birefringeuce 0·009 to 0·010. Three varieties have been distinguished, according to the direction of elongation of the fibers. (1) In *chalcedony* the elongation coincides with the axis $\mathfrak{a}$ (= $Bx_o$), in other words the direction of the fibers is sometimes said to be negative. (2) In *quartzine* it coincides with $\mathfrak{c}$, and in *lutécine* with a plane of symmetry (= $Bx_a$) to the axes $\mathfrak{c}$ and $\mathfrak{b}$, the fibers making an angle of 29° with $\mathfrak{c}$ and of 61° with $\mathfrak{b}$.

As interpreted by Michel-Lévy and Munier-Chalmas the regular arrangement of the fibers of chalcedony give rise to spherulites with concentric zones of like extinction; regular ternary (120°) aggregates of quartzine are regarded as producing ordinary quartz; the regular hexagonal (60°) arrangement of the elementary *lutécine* gives the double hexagonal pyramids of *lutécite*, aggregates about an axis inclined 45° to $\mathfrak{c}$ and 74° to the elongation of the fibers in the plane $\mathfrak{b}$ and $\mathfrak{c}$. According to Wallerant (l. c.) all quartz is to be regarded as formed by regular intergrowths of minute elements of quartzine.

It is obvious that these three forms of fibrous silica are essentially identical, and all their various aggregates seem to have been derived from original colloidal concretions. Groth (Tab. Ueb., 42, 1898) uses *quartzine* as a general term to embrace them all.

On quartzine from Heřman Mestec, Barviř, Ber. Ak. Böhm., March 10, 1893.

*Christobalite* (p. 193) has been shown to result from the action of water and hydrofluoric acid (at 200° and 26 atmospheres) upon amorphous silica, Khrushchov, Bull. Acad. St. Pet., **2**, 27, 1895.

On the peculiar form of silica obtained from heulandite, with G. = 2·14 and optically negative, see Rinne, Jb. Min., 147, 1896.

QUENSTEDTITE, p. 957.—A ferric sulphate having the composition of quenstedite has been observed by O. Kuntze as a yellow incrustation in sandstone near Montpellier, Muscatine county, Iowa. H. = 2·5. G. = 2·212. Analysis gave: $SO_3$ 39·01, $Fe_2O_3$ 26·86, $Al_2O_3$ 0·27, $H_2O$ 32·32, insol. ($SiO_2$) 1·79 = 100·25. Amer. Geol., **23**, 119, 1899.

**Quirogite.** L. F. Navarro [Anal. Soc. Españ. Hist. Nat., **24**, Actas p. 96, 1895] Zs. Kr., **28**, 202, 1897. A supposed tetragonal mineral of metallic luster and lead-gray color, often tarnished dull. H. = 3. G. = 7·22. Analysis on material containing pyrite gave: S 17·51, Pb 63·89, Sb 9·69, Fe 6·30, Ag *tr.* = 97·39. From the mines San Andrés, Georgina, etc., Sierra Almagrera, Spain. Named after the Spanish mineralogist, F. Quiroga. Probably only an impure galena (cf. remarks credited to Schrauf, Zs. Kr., l. c.).

**Ransätite.** *L. J. Iglesträm*, G. För. Förh., 18, 41, 1896.—See *Garnet.*

**Raspite.** *C. Hlawatsch*, Ann. Mus. Wien, **12**, 38, 1897; Zs. Kr., **29**, 137, 1897; **31**, 8, 1899.

Monoclinic. Axes $\grave{a} : \bar{b} : \acute{c}$ = (1·3358 : 1 : 1·1112; $\beta$ = 72° 19′ = 100 ∧ 001 = *ac*. Angles *ce* = 46° 41′, *cd* = 46° 38′. Observed forms: *a* (100), *b* (010), *c* (001), *e* ($\bar{1}01$), *d* (011). Crystals small, elongated ∥ $\bar{b}$ and tabular ∥ *a* with this face as twinning plane; *a* striated horizontally.

Cleavage: *a* perfect. H. = 2·5. G. undetermined. Luster adamantine, brilliant. Color brownish yellow. Transparent. Ax. pl. ∥ *b*. An axis and negative bisectrix oblique to *a*. Index = 2·6 approx.

Composition, lead tungstate, $PbWO_4$, like stolzite. Analysis, Treadwell:

$WO_3$ 49·06  PbO 48·32  $Fe_2O_3$,MnO 1·43 = 98·81

Occurs with reddish stolzite on limonite at the Broken Hill mines, New South Wales. Named after Mr. Rasp, the discoverer of the Broken Hill mines.

**Rathite.** *Baumhauer*, Zs. Kryst., **26**, 593, 1896.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ : = 0·6681 : 0 : 1·0579. 100 ∧ 110 = 33° 44⅜′, 001 ∧ 101 = 57° 43⅜′, 001 ∧ 011 = 46° 36⅜′. Also 001 ∧ 203 = *46° 33′, 001 ∧ 045 = *40° 14¼′, 001 ∧ 021 = 64° 42′. Observed forms: (001), (107), (106), (209), (207), (103), (205), (102), (203), (405), (101), (403), (302), (201), (401), (601); (045), (0·11·10), (021), (0·16·3); also other forms in part vicinal.

In crystals, prismatic ∥ $\bar{b}$, with numerous macrodomes finely striated ∥ an undetermined brachydome. Twins: tw.-plane an obtuse brachydome. In luster and color not to be distinguished from dufrenoysite.

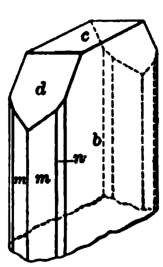
In composition allied to dufrenoysite and jamesonite, but formula uncertain. Analysis, Bömer:

S 23·72 As 17·24 Sb 4·53 Pb 52·98 Fe 0·56 = 99·03

From the dolomite of the Binnenthal, Switzerland, with other related species. Named after Prof. G. vom Rath (1830–1888).

REALGAR, pp. 33, 1046.—Crystals from Allchar, Macedonia, described (new form ζ (450)), Hackman, Zs. Kr., **27**, 608, 1896; also Vrba, Ber. Ak. Böhm., Dec. 7, 1894.

**Retzian.** *Hj. Sjögren*, Bull. G. Inst. Upsala, **2**, 54, 1894; G. För. Förh., **19**, 106, 1897.



Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c}$ = 0·4414 : 1 : 0·7269. Forms: *b* (010), *m* (110), *n* (130), *d* (101), *k* (071). Angles: $mm''' = 47° 38'$, $bm = {}^*66° 11'$, $cd = {}^*58° 44'$. Crystals prismatic, sometimes tabular ∥ *b*. The axial ratio is near that of flinkite (Min., p. 802).

Cleavage none. Fracture conchoidal to uneven. H. = 4. G. = 4·15. Luster vitreous to greasy. Color dark chocolate-brown to chestnut-brown. Streak light brown. Subtranslucent. Strongly pleochroic. Ax. pl. ∥ *b*. Ax. angle large. $\mathfrak{a}, \mathfrak{b}, \mathfrak{c} = \dot{c}, \bar{b}, \breve{a}$.

In composition, a basic arsenate of manganese, calcium and undetermined rare metals; formula uncertain. Analysis, on 0·08 gr., R. Mauzelius:

| $As_2O_5$ | X* | MnO | FeO | PbO | CaO | MgO | $H_2O$ | |
|---|---|---|---|---|---|---|---|---|
| 24·4 | 10·3 | 30·2 | 1·7 | 0·2 | 19·2 | 2·7 | 8·4 | $SiO_2$ 0·5, insol. 4·3 = 101·9 |

* X = rare earths.

B.B. almost infusible; yields water. With soda on charcoal gives arsenical fumes; reacts for manganese and iron. Soluble in acids.

Found sparingly in small drusy cavities in the manganiferous limestone of the Moss mine, Nordmark, Sweden; it is associated with jacobsite. Named after the Swedish naturalist, Anders Jahan Retzian (1742–1821).

RHABDITE, p. 31.—See *Schreibersite.*

**Rhodoarsenian.** *L. J. Igelström*, Zs. Kr., **22**, 469, 1893. A partially described mineral from the Sjö mine, Örebro, Sweden. Occurs in small rose-red spherules embedded in arseniopleite. H. = 4. Luster vitreous. An analysis (after deducting $CaCO_3$) yielded: $As_2O_5$ 12·17, MnO 49·28, CaO 21·53, MgO 5·37, $H_2O$ 11·65, Pb,Cl *tr.* = 100. Regarded as the arsenic compound corresponding to ferrostibian (Min., p. 804).

RHODOCHROSITE, p. 278.—Artificial formation, A. de Schulten, Bull. Soc. Min., **20**, 195, 1897.

**Rhodolite.** *Hidden* and *Pratt*, Am. J. Sc., **5**, 294; **6**, 463, 1898.—See *Garnet.*

RHODONITE, pp. 378, 1046.—Etching-figures investigated, T. L. Walker, Am. J. Sc., **5**, 182, 1898.

**Rhodophosphite.** *L. J. Igelström*, Zs. Kryst., **25**, 433, 1895. A mineral occurring in a quartzite carrying cyanite with svanbergite, lazulite, etc., at the Hörrsjöberg Mts., Wermland, Sweden. Occurs crystalline (hexagonal). cleavable; color white or pale red; translucent. Analysis: $P_2O_5$ 36·42, CaO 45·17, MnO.FeO 8·80, Cl 2·92, $SO_3$ 1·34, F *undet.* = 94·65 (author gives 97·93). It is probably simply apatite.

**Rhodusite.** H. B. Foullon, Ber. Ak. Wien, **100** (1), 176, 1891.—See *Glaucophane.*

RICHTERITE, pp. 386, 391.—Hj. Sjögren has shown that the original mineral of Breithaupt is identical with that examined by Michaelson, Igelström and Flink. His astochite (Min., p. 1027) is simply a *soda-richterite*, see astochite, this Append., p. 6). Sjögren also refers here the marmairolite of Hulst, Min., p. 391. G. För. Förh., **13**, 604, 1891; *ib.*, **14**, 253, 1892; Bull. G. Inst. Upsala, **2**, 71, 1894; also Hamberg, G. För. Förh., **13**, 801, 1891.

RIEBECKITE, pp. 400, 1047.—Occurs in pebbles in the glacial drift of the east coast of Ireland; crystals found at Portrane have been measured by Sollas. Observed forms: *b* (010), *m* (110), *x* (150), *t* (101), *p* ($\bar{1}$01), *r* (011), *s* ($\bar{1}$21). Angles: $mm''' = 56°$, $pm' = 77° 50'$, $pt = 54° 20'$, hence $\grave{a} : \bar{b} : \dot{c}$ = 0·5558 : 1 : 0·2927, $\beta$ = 73° 4′. A partial analysis gave: $SiO_2$ 42·69, $Al_2O_3,Fe_2O_3$ 41·71, $Na_2O$ 10·00, $K_2O$ 0·87. Proc. R. Irish Acad., **3**, 516, 1895.

Heddle has noted on crystals from the micro-granite of Ailsa Craig, Scotland, the additional forms: *a* (100), *c* (001), *s* (130), *i* (031), *o* (021). Trans. Edinb. G. Soc., **7**, 265, 1897.

Occurs in an intrusive rock in slates between Song and Tikobu, Southern Sikkim, India, Holland, Rec. G. Surv. India, **25**, 159, 1892. Extinction-angle 7° 30′ to 10° with ċ. Also reported by A. Osann as occurring in the nephelite-syenite of Paisano Pass, Davis Mountains, Texas, Geol. Surv. Texas, 4th Ann. Report, 1892, p. 28. Occurs in trachytic rocks from Abyssinia, Prior, Min. Mag., **12**, 92, 1899.

See *Crossite.*

RITTINGERITE, p. 136.—Shown by Miers to be identical with xanthoconite, wh. see. Min. Mag., **10**, 185, 1893.

**Roeblingite.** *S. L. Penfield* and *H. W. Foote*, Am. J. Sc., 3, 413, 1897.

Massive; closely compact; consisting of aggregates of prismatic crystals. H. = 3·25. G. = 3·433. Color white. Extinction parallel; birefringence low.

Composition, probably $H_{10}Ca_7Pb_2Si_5S_2O_{28}$, which is regarded as a combination of five molecules of the silicate, $H_2CaSiO_4$, and two of the basic sulphite, $CaPbSO_4$. This requires: Silica 22·1, sulphur trioxide 9·4, lead protoxide 32·9, lime 29·0, water 6·6 = 100. Analysis:

| | $SiO$ | $SO_3$ | $PbO$ | $MnO$ | $CaO$ | $SrO$ | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| ½ | 23·58 | 9·00 | 31·03 | 2·48 | 25·95 | 1·40 | 0·13 | 0·40 | 6·35 = 100·32 |

Fuses B. B. at 3 to a gray globule giving the pale blue flame of lead. With soda on charcoal yields metallic lead and a lead coating. In the closed tube yields water. Dissolves readily even in dilute acid, yielding gelatinous silica on evaporation.

Found at a depth of 1000 feet in the Parker shaft at Franklin Furnace, N. J.; occurs at or near the contact of the granite and limestone with garnet rock; associated with titanite, axinite, zircon, willemite, rhodonite, etc. Named after W. A. Roebling of Trenton, N. J.

ROUMÄNITE.—See *Rumänite*, Min., p. 1005.

ROWLANDITE, p. 1047.—Further described by Hidden with analysis by Hillebrand, Am. J. Sc., **46**, 208, 1893.

RUTILE, pp. 237, 1047.—Crystals from the Valais, twins, etc., described, Baumhauer, Cong. Sc. Catholiques, Fribourg, 1897.

Parting | (902) (cf. Min., p. 238) observed on crystals from Prägratten and Georgia, Mügge, Jb. Min., **2**, 82, 1897.

Occurs at West Cheyenne Cañon, El Paso Co., Colorado, in iron-black distorted crystals containing 6·68 p. c. $Fe_2O_3$; G. = 4·249, Genth and Penfield, Am. J. Sc., **44**, 384, 1892.

Shown by spectroscopic examination to often contain vanadium in small amount, Hasselberg, Astrophysical Journal, **6**, 22, 1897; **9**, 143, 1899. Ak. H. Stockh., Bih., **23**, (1), No. 3, 1898. Cf. also Hillebrand, Am. J. Sc., **6**, 209, 1898.

Artificial formation, Michel, Bull. Soc. Min., **15**, 37, 1892.

See *Dicksbergite.*

SAFFLORITE, p. 100.—A related mineral occurs at the Kö mine, Nordmark, Sweden, with chondrodite, tremolite, etc. Usually massive, rarely in prismatic crystals elongated, | $\bar{b}$; *e* (101) prominent. Forms: *a* (100), *m* (110), *e* (001), *d* (011), *o* (111). Angles *ee′′′* = 59° 14′, *oo′* = 105° 20′. Axial ratio $\breve{a} : \bar{b} : \dot{c}$ = 0·5086 : 1 : 0·8945 or 0·6782 : ½ 1·1927, the latter showing the relation to arsenopyrite, etc. G. = 7·41. Analysis by R. Mauzelius: As 71·18, S 0·68, Fe 15·28, Co 12·99, Ni 0·20, Pb(Cu) 0·33 = 100·61. This gives the formula (nearly) $FeAs_2.CoAs_2$. Hj. Sjögren, Bull. G. Inst. Upsala, **2**, 68, 1894.

SAL-AMMONIAC, p. 157.—Observations on crystals, Wolff, Ber. Ak. Berlin, 1085, 1895.

SALITE, p. 356.—See *Pyroxene.*

**Salvadorite.** *W. Herz*, Zs. Kryst., **26**, 16, 1896.

Monoclinic. In aggregates of rough prismatic crystals, with *m* (110), also *b* (010); *mm′′′* = 48° 16′. Crystals often twins united by a plane inclined 30° to ċ.

Cleavage: *b* perfect. Luster vitreous. Color green to blue, bluish green. Ax. pl. | *b*. $Bx_a$ inclined 52° to ċ for Na (on same side as tw. plane), 46½° for Tl; ax. angle 76° for Na.

Composition like pisanite (Min., p. 943), $(Cu,Fe)SO_4 + 7H_2O$ with Cu : Fe = 2 : 1. Analyses:

| | $SO_3$ | $CuO$ | $FeO$ | $H_2O$ |
|---|---|---|---|---|
| 1. *Green* | 27·87 | 18·77 | 8·49 | 44·65 = 99·78 |
| 2. *Blue* | 28·16 | 17·57 | 9·59 | 44·31 = 99·63 |

From the Salvador mine, Quetena near Calama, Chili. Differs from pisanite in optical orientation and apparently in form.

**SAMARSKITE**, pp. 739, 1037.—Contains germanium in small amount (1·5 p. c.); this is also true of tantalite, fergusonite, gadolinite, columbite, etc., Khrushchov, Zs. Kr., **24**, 516, 1895. Analysis from the Ural by the same, Vh. Min. Ges., **31**, 415, 1894.

Examination of gases (helium, etc.), Ramsay, Proc. Roy. Soc., **59**, 325, 1896. Ramsay and Travers, *ib.*, **60**, 443, 1897.

**SARTORITE**, p. 113.—Description of complex crystals (new forms) from the Binnenthal with analysis, Baumhauer, Ber. Ak. Berlin, 243, 1895.

**SCAPOLITE**, p. 466.—Crystals from Eel lake, Frontenac Co., Ontario, described, G. O. Smith, Johns Hopkins Circ., No. 112, May, 1894. Analysis of a "paranthite" from Clay Co., N. C., Berkley, Am. Ch. J., **14**, 628, 1892.

See also *Wernerite.*

**SCHEELITE**, p. 985.—From Marlow township, Beauce Co., Quebec, analysis by Johnston quoted by Hoffmann, Rep. G. Canada, **5**, 21R, 1889-90; also from the Ballou mine, Queens Co., Nova Scotia, *ibid.*, **7**, 14R.

Occurs at South Mountain, Pa., with piedmontite in an ancient rhyolite, Williams, Am. J. Sc., **44**, 50, 1893.

**SCHEFFERITE**, p. 357.—See *Pyroxene.*

**SCHNEEBERGITE**, p. 862.—See *Garnet.*

**SCHOENITE**, p. 948.—See *Picromerite.*

**SCHREIBERSITE**, p. 31.—Cohen, as the result of an investigation of many meteoric irons, has shown that the tetragonal iron-nickel phosphide, called *rhabdite* (Min., p. 31), is identical with schreibersite; the relative amounts of the metals vary widely. Ann. Mus. Wien, **9**, 97, 1894.

"Rhabdite" occurs in tetragonal crystalline forms (with (001), (110), (111)) in the meteoric iron of Bendegó, Brazil; 110 ∧ 111 = 39°–40° Hussak. Cf. Derby, Arch. Mus. Nac., Rio de Janeiro, **9**, 171, 1896.

**Schulzenite.** *P. Martens* [Act. Soc. Sci. Chili, **5**, 87, 1895], Bull. Soc. Min., **19**, 211, 1896. A doubtful substance of uncertain origin, related to asbolite. Found in the collection of J. Schulze and supposed to have come from northern Chili. Amorphous with conchoidal fracture. H. = 3·5. G. = 3·39. Color and streak black. Gives off chlorine when treated with hydrochloric acid. Analysis gave: Co 46·76, Cu 12·65, $SiO_2$ 1·76, $Fe_2O_3$ 0·29, $H_2O$ (comb.) 14·08, $H_2O$ (hygr.) 4·92, O [19·54] = 100. From this the formula is deduced: $CuO.2CoO.Co_2O_3 + 4H_2O$.

**SCOLECITE**, p. 604.—Referred to the clinohedral group of the monoclinic system by Rinne, who gives the results of investigation by etching, pyroelectricity, etc. Jb. Min., **2**, 51, 1894. Moderate heating causes a partial loss of water, and this is accompanied by molecular changes, the new form being called *metascolecite*, *ibid.*, p. 60; also Ber. Ak. Berlin, **46**, 1163, 1890.

Crystals from the Tulferthal, Tyrol, described by Habert, Zs. Kr., **28**, 252, 1897.

Analysis, from granite on the Struth, Thuringia, Fomme [Ber. phys.-med. Soc. Erlangen, **25**, 1893], Zs. Kr., **26**, 616. Also from Italian Peak, Gunnison Co., Colo., Eakins, Bull. U. S. G. Surv., **113**, 112, 1893.

**SCORODITE**, p. 821.—Crystals from the Lölling show the forms *h* (101), *f* (011), Busz, Zs. Kr., **20**, 555, 1892.

**Seelandite.** *Brunlechner* [Jb. Nat. Land.-Mus. Klagenfurt, **22**, 192, 1893], Bull. Soc. Min., **19**, 121, 1896. A variety of pickeringite forming an efflorescence on the siderite of Lölling, Carinthia. Composition, $MgAl_2(SO_4)_4 + 27H_2O$, deduced from the analysis: $SO_3$ 34·08, $Al_2O_3$ 10·54, MgO 4·07, $H_2O$ 51·22 = 99·86.

**SEMSEYITE**, p. 123.—L. J. Spencer has described (Min. Mag., **12**, 60, 1899) crystals from Wolfsberg similar to Krenner's mineral and yielding: S 19·42, Sb 28·62, Pb 51·84 = 99·88, G. = 5·92; calculated formula $21PbS.10Sb_2S_3$. The form is near that of plagionite. The author also discusses the relations of plagionite, heteromorphite and semseyite, and the suggestion is made that they may form a morphotropic series from $5PbS.4Sb_2S_3$ (through $7PbS.4Sb_2S_3$, etc., heteromorphite) to $9PbS.4Sb_2S_3$. The complex formulas often obtained (cf. plagionite) may be explained by assuming that the crystals analyzed in a given case are compounded of smaller crystals in nearly parallel position but differing among themselves slightly in angle and composition.

**Senaite.** *E. Hussak* and *G. T. Prior*, Min. Mag., 12, 30, 1898.

Tri-rhombohedral like ilmenite (phenacite type). Axis 0·997. *cr* = 49° 4′. In crystals with the forms *c* (0001); *r* $(10\bar{1}1)$, *S* $(20\bar{2}1)$, *s* $(40\bar{4}1)$. Twins common, tw. pl. *a* $(11\bar{2}0)$.

Cleavage none. Fracture conchoidal. H. = 6 or slightly above. G. = 5·301 unchanged cryst.; 4·78 fresh grains; 4·22 altered cryst. Luster submetallic. Color black. Streak brownish black. In very thin splinters oil-green to greenish brown. Optically uniaxial; birefringence low. Not magnetic.

Composition uncertain; if the iron is all FeO and the manganese $MnO_2$, the approximate formula is $(Fe,Pb)O.2(Ti,Mn)O_2$. Analysis, Prior:

| $TiO_2$ | $Fe_2O_3$ | PbO | FeO | MnO | MgO | $SnO_2$ |
|---|---|---|---|---|---|---|
| 57·21 | 20·22 | 10·51 | 4·14 | 7·00 | 0·49 | 0·11 = 99·68 |

Occurs in rounded fragments and rough crystals in the diamond-bearing sands of Diamantina, Minas Geraes, Brazil. Named after Prof. Joachim da Costa Sena of Ouro Preto, Brazil.

SENARMONTITE, p. 198.—Occurs at Nieddoris, Sardinia, Brugnatelli, Rend. Accad. Linc., 3 (1). 78, 1894.

SEPIOLITE, p. 680.—Optical structure investigated, also of other compact "amorphous" minerals (glauconite, celadonite, halloysite, nontronite), which are shown to be crystalline with minute mica-like scales, Lacroix, C. R., 121, 737, 1895; Bull. Soc. Min., 18, 426, and Min. France, Vol. 1.

Analysis from Eskishehir, Asia Minor, Weinschenk, Zs. Kr., 27, 574, 1896.

SERPENTINE, pp. 669, 1047.—Anal.—Kynance Cove, Lizard, England, aluminous var. (pseudophyte), Fox, Min. Mag., 9, 275, 1891. Binnenthal, Duparc and Mrazec, Bull Soc. Min., 17, 210, 1894. Elzivir, Ontario, antholite, Coleman, Am. J. Sc., 48, 281, 1894. Serpentine and serpentine rocks of northern Syria, formation from gabbros and associated peridotites, Finckh, Zs. G. Ges., 50, 118 *et seq.*, 1898.

Comp.—Discussion of composition with experiments and analyses, R. Brauns, Jb. Min., 1, 205, 1894; Zs. anorg. Ch., 8, 348, 1895, Schneider, *ibid.*, 8, 98, 1895; A. Lindner [Inaug. Diss., Breslau, 1893], Zs. Kr., 25, 589, 1896.

Occurrence and associated minerals in the Austrian Alps, Weinschenk, Zs. Kr., 26, 337, 27, 559, 1896.

SERPIERITE, p. 963.—Laurion, Greece, analysis by Frenzel: (G. = 2·52), $SO_3$ 24·29, CuO 36·12, ZnO 13·95, CaO 8·00, $H_2O$ 16·75 = 99·11. The formula deduced is $3(Cu,Zn,Ca)SO_4 + 3H_2O$. Min. petr. Mitth., 14, 121, 1894.

SIDERITE, pp. 276, 1047.—Description of crystals from France with the new forms $(03\bar{3}2)$, $(10\bar{1}2)$, $(30\bar{3}4)$, Gonnard, Bull. Soc. Min., 18, 382, 1895.

From Neunkirchen, Siegen, containing 3·85 p. c. CoO, Bodländer, Jb. Min., 2, 236, 1892. Occurrence and origin in the Province of Drenthe, Holland, G. M. van Bemmelen, Arch. Néerland., 30, 25, 1897. Occurrence in the Mecklenburg Moors, A. Gärtner, Arch. Ver. Meckl., 51, 1897.

The "clay-ironstone" of Yorkshire, England, contains gallium, Hartley and Ramage, Proc. Roy. Soc., 60, 35, 393, 1896.

**Siderotil.** *A. Schrauf*, Jb. G. Reichs., 41, 380, 1892. A rare iron sulphate occurring in groups of divergent needles with melanterite at Idria, Carniola. Composition, $FeSO_4.5H_2O$, deduced from the approximate analysis: $SO_3$ 34·3, $Fe_2O_3$ 31·7, FeO 30·0, $H_2O$ [34·0], MgO *tr.* = 100.

SILICATES.—Discussion of constitution, F. W. Clarke, Bull. U. S. G. Surv., 125, also 113.

SILLIMANITE, p. 498.—Experimental investigation of conditions of formation in a magma, Morozewicz, Min. petr. Mitth., 18, 22, 1898.

SILVER, p. 19.—Occurs at Silver Hill, near Livingston, Davidson Co., N. C., Kunz, Am. J. Sc., 7, 242, 1899. Also in groups of minute crystals at the Elkhorn mine, Jefferson Co., Montana (Pfd.).

**Sjögrufvite.** *Igelström*, G. För. Förh., 14, 309, 1892. A partially investigated mineral from the Sjö mine, Örebro, Sweden. Occurs in cavities and minute veins with jacobsite. Crystalline. Color yellow; blood-red in thin layers. Streak yellow. Dissolves completely in cold hydrochloric acid without evolution of gas. Analysis gave: $As_2O_5$ 49·46, $Fe_2O_3$ 11·29, MnO 27·26, CaO 3·61, PbO 1·74, $H_2O$ 6·81 = 100·17. It is related to arseniopleite (Min., p. 808).

**Skutterudite**, p. 93.—Crystals from the Turtmannthal, Switzerland, show the forms: *a* (100), *o* (111), *d* (110), *e* (210), *n* (211). Analysis: As 74·45, S 0·72, Bi 4·40, Co,Ni 16·47, Fe 3·90, gangue 0·28 = 100·22. Staudenmaier, Zs. Kr., 20, 468, 1892.

*Bismutosmaltite* is a skutterudite containing bismuth. Occurs in small crystals, *a* and *o* or *a* and *d*. Brittle. H. = 6. G. = 6·92. Luster metallic. Color tin-white. Streak black. Composition, $Co(As,Bi)_3$. Analysis: As 61·59, Bi 20·17, Sb 0·16, Co 13·70, Cu 0·69, Fe 3·71, S 0·05 = 100·07. Occurs with other bismuth minerals at Zschorlau, near Schneeberg, Saxony. Frenzel, Min. petr. Mitth., 16, 524, 1896.

*Nickel-skutterudite* is a variety occurring in granular form in the Bullard's Peak distr., Grant Co., New Mexico. H. = 5; color gray; streak black. Analysis, after deducting 4·56 $SiO_2$ and 8·38 Ag (native silver), yielded: As 78·10, Ni 12·89, Co 5·95, Fe 3·06 = 100. This corresponds to $RAs_3$ with R = Ni : Co : Fe = 4 : 2 : 1. Waller and Moses, Sch. Mines Q., 14, 49, 1892.

**Smithsonite**, p. 279.—A variety from Boleo, Lower California, has a delicate pink color, G. = 3·874, and contains 89·02 p. c. ZnO, 10·25 CoO, 3·36 MnO, 7·22 MgO. C. H. Warren, Am. J. Sc., 6, 123, 1898.

Analysis of the "turkey-fat ore" of Marion Co., Arkansas, gave H. N. Stokes, CdS 0·25, CdO 0·63, etc., Bull. U. S. G. Surv., 90, 62, 1892.

On the occurrence of lead and zinc ores in Iowa, A. G. Leonard, Iowa Geol. Surv., 6, 1896.

**Soda-berzeliite.**—See *Berzeliite.*

**Soda-niter**, p. 870.—On the morphology, see Wolff, Ber. Ak. Berlin, 715, 1895; 135, 1896.

**Soda-richterite.**—See *Astochite* and *Richterite.*

**Sodalite**, p. 428.—Anal.—Hastings Co., Ontario, etc., Luquer and Volckening, Am. J. Sc., 49, 465, 1895. Dungannon, Hastings Co., Ontario, Harrington, *ibid.*, 48, 17, 1894. From the trachyte of Montesanto, Italy, Franco, Zs. Kr., 25, 332, 1895.

Reported by Osann as occurring in the nephelite-syenite of Paisano Pass, Davis Mts., Texas, Geol. Surv. Texas, 4th Ann. Rep., 128, 1892.

On the formation of some twenty-five analogous compounds, Thugutt [Inaug. Diss., Dorpat, 1891], Zs. anorg. Ch., 2, 65, 113, 1892, also Jb. Min., 2, 10 ref., 1893.

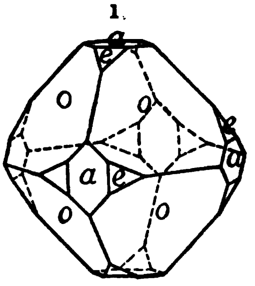
Experimental investigation of conditions of formation in a magma (also for related species), Morozewicz, Min. petr. Mitth., 18, 128, 1898.

**Spangolite**, p. 919.—Associated with connellite, clinoclasite, liroconite from Cornwall (probably the St. Day distr., Redruth?); in *hemimorphic*, hexagonal crystals, pyroelectric. Miers Nature, 48, 426, 1893, and Min. Mag., 10. 273, 1894.

**Sperrylite**, p. 92.—Crystals from the Vermillion mine show the diploid (10·5·2), T. L. Walker, Am. J. Sc., 1, 110, 1896.

Occurrence and crystals (Fig. 1 by G. H. Edwards) described, from Macon Co., N. Carolina, Hidden, Am. J. Sc., 6, 381, 467, 1898.

1.



Sperrylite

**Sphærostilbite**, p. 583.—Prior shows that the supposed mineral of Beudant probably has no existence. Specimens from various localities called by this name proved to be thomsonite, not stilbite. Min. Mag., 12, 26, 1898.

**Sphalerite**, pp. 59, 1048.—Cryst.—Binnenthal, new form $31\bar{6}$, Cesàro, Bull. Acad. Belg., 25, 88, 1893; also earlier 618 (or $6\bar{1}8$), *idem*, Ann. Soc. G. Belg., 17, 237, 1890. Kis-Almás, Hungary, new form (10·10·1), Franzenau, Zs. Kr., 27, 95, 1896 Galena, Ill., new form (775), Hobbs, Bull. Univ. Wisconsin, 1, 134, 1895, and Zs. Kr., 25, 268 Harz Mts., Luedecke, Min d. Harzes, 53 1896. Val Trompia, Bóvegno, Artini, Rend. Ist. Lombardo, 30, 1526, 1897.

Analysis of "schalenblende" from Mies, Bohemia, with 1·02 p. c. cadmium, Becke, Min. petr. Mitth., 14, 278, 1894.

Peelwood, N. S. W., contains gallium and indium, Kirkland, Austr. Assoc. Adv. Sci., 4, 266, 1892.

A variety (Cornwall?) containing 9·29 p. c. Fe has perfect metallic luster, Miers, Min. Mag., 12, 111, 1899.

**Spinel**, pp. 220, 1048.—Experimental investigation of the conditions of formation in a magma, Morozewicz, Min. petr. Mitth., 18, 22, 1898

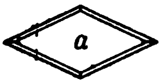
**Spodiosite**, p. 777.—Crystals from Nordmark, Sweden, examined by G. Nordenskiöld were orthorhombic with the forms: *a* (100), *b* (010), *c* (001), *m* (110), *d* (102), *e* (021), *p* (111), *q* (254)?, *r* (854)?. Axes deduced $\breve{a} : \bar{b} : \dot{c} = 0·8944 : 1 : 1·5836$; *bm* = *48° 11′·4, *cp* = *67° 10′·2. Analysis on material much decomposed gave (cf. anal., p. 777): $P_2O_5$ 29·62, CaO 45·84, MgO 8·56, $Al_2O_3 + Fe_2O_3$ 2·38, $SiO_2$ 8·74, $H_2O$ 3·76, F 2·94 = 101·84. The formula deduced is $m Ca_3P_2O_8 + n CaF_2$. G. För. Förh., **15**, 460, 1893.

**Stannite**, p. 83.—Tetrahedral crystals are mentioned by vom Rath, Vh. Ver. Rheinl., **41**, 296, 1884; also Stelzner (from Bolivia), Zs. G. Ges., **49**, 97, 1897.

Shown by Headden to occur at the Peerless and Etta mines, Black Hills, S. Dakota, Am. J. Sc., **45**, 105, 1893. Analysis (Peerless mine) gave: S 28·26, Sn 24·08, Cu 29·81, Fe 7·45, Zn 8·71, Cd 0·33, Sb *tr.*, insol. 1·51 = 100·15. G. = 4·534; color grayish black. Largely altered by oxidation to a greenish earthy mass; this substance has been made by Ulke (Trans. Am. Inst. Mng. Eng., **21**, 240, Feb., 1892) the basis of a new species, *cuprocassiterite*, supposed (as the result of a partial analysis) to have the formula, $4SnO_2 + Cu_2Sn(OH)_2$. Headden shows, however, that the composition varies widely.

**Staurolite**, p. 558.—Penfield and Pratt, on the basis of new analyses (below) on pure material, have established the formula $HAl_5FeSi_2O_{12}$, or $(AlO)_4(AlOH)Fe(SiO_4)_2$. Sections of crystals from Lisbon, N. H., show a regular arrangement of carbonaceous inclusions, thus Figs. 1 to 4, cut from the same crystal.

1.



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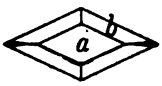

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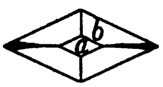

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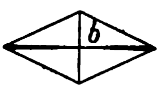


| | G. | | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | MgO | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 1. St. Gothard | 3·748 | [illegible] | 27·73 | 53·29 | 2·83 | 11·21 | 0·53 | 1·81 | 2·19 = 99·59 |
| 2. Windham, Me. | 3·728 | [illegible] | 27·84 | 54·46 | 2·83 | 10·60 | 0·59 | 1·85 | 2·24 = 100 41 |
| 3. Lisbon, N. H. | 3·775 | | 27·81 | 54·09 | 2·76 | 12·48 | — | 1.92 | 1·70 = 100·76 |
| 4. Burnsville, N. C. | 3·778 | [illegible] | 27·70 | 53·22 | 4·82 | 9·72 | 0·34 | 2·66 | 1·97 = 100·43 |

The composition has also been discussed by Rammelsberg, Jb. Min., Beil.-Bd., **9**, 480, and Ber. Ak. Berlin, 435, 1893.

**Steenstrupine**, p. 415.—Further examined by Moberg (Zs. Kr., **29**, 386, 1898) with the following results: Crystallization rhombohedral, axis $\dot{c} = 1·0842$, *cr* = *51° 23′, *rr′* = 85° 10′. Forms: *c* (0001), *a* (11$\bar{2}$0), *ρ* (50$\bar{5}$9), *r* (10$\bar{1}$1), *s* (40$\bar{4}$1), *ε* (01$\bar{1}$3), *e* (01$\bar{1}$2), *f* (04$\bar{4}$5), *d* (02$\bar{2}$1), *ξ* (08$\bar{8}$1). Habit rhombohedral, *r* predominating. Cleavage none. Fracture conchoidal. H. = 4. G. = 3·40–3·47 cryst.; 3·19 massive. Luster resinous. Color dark brown to nearly black. Streak brown. Optically –. Birefringence low. By alteration isotropic. Analyses by Blomstrand, 1 on crystals and 2, 3 on massive material; all somewhat altered, the crystals least so. About one-third of the water goes off at 100° to 110°.

| | $SiO_2$ | $(Ta,Nb)_2O_5$ | $P_2O_5$ | $ThO_2$ | $Ce_2O_3$ | $\underbrace{(La,Di)_2O_3\ Y_2O_3}$ | $Fe_2O_3$ | $Mn_2O_3$ | MnO | $\underbrace{Al_2O_3\ BeO}$ | CaO | PbO | $Na_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 26·57 | 1·21 | 5·81 | 3·03 | 14·40 | 15·90 | 4·55 | 1·82 | 2·32 | 2·55 | 4·03 | 0·46 | 8·34 |

$K_2O$ 0·50, $H_2O$ 7·58 = 99·07

| | $SiO_2$ | $(Ta,Nb)_2O_5$ | $P_2O_5$ | $ThO_2$ | $CeO_2$ | $(La,Di)_2O_3$ | $Y_2O_3$ | $Fe_2O_3$ | $Mn_2O_3$ | $Al_2O_3$ | BeO | CaO | PbO | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2. | 20·61 | 1·58 | 4·53 | 3·84 | 17·85 | 15·52 | 2·19 | 5·18 | 5·79 | 0·40 | 1·22 | 4·22 | 1·02 | 2·53 | 12·73 = 99·21 |
| 3. | 21·30 | 1·02 | 4·39 | 4·13 | 19·40 | 16·68 | 1·68 | 4·91 | 6·80 | 0·60 | 1·93 | 4·55 | 0·78 | 2·54 | 10·30 = 101·01 |

**Stephanite**, pp. 143, 1025, 1048.—**Cryst.**—Sarrabus, Sardinia, crystal monograph, new forms noted: (510)?, (230), (0·5·11)?, (818), (18·5·5), (13·4·4), (7·11·9), (872), (141), (2·10·1), (161). Artini, Giorn. Min., **2**, 241, 1891. Přibram, cryst. memoir, new forms: *N* (522), $r_3$ (441), $h_3$ (9·13·18)?, $t_3$ (8·33·16)?, Nejdl, Ber. Böhm. Ges., Feb. 8, 1895. Harz Mts., Luedecke, Min. d. Harzes, 168, 1896. Chili, new forms (551), (10·10·3), L. J. Spencer, Min. Mag., **11**, 196, 1897.

**Stevensite.**—See *Talc.*

**Stibiotantalite.** *G. A. Goyder*, J. Ch. Soc., **63**, 1076, 1893. A mineral substance, occurring in water-worn fragments in the tin-bearing sands of Greenbushes, West Australia. Analysis on nearly pure material gave: $Ta_2O_5$ 51·13, $Nb_2O_5$ 7·56, $Sb_2O_3$ 40·23, $Bi_2O_3$ 0·82, NiO 0·08, $H_2O$ 0·08 = 99·90. G. = 7·37. H. = 5–5·5. Luster adamantine to resinous. Color pale reddish yellow to greenish yellow and yellow. Fracture subconchoidal to granular. Structure crystalline.

**Stibnite**, pp. 36, 1048.—**Cryst.**—Cetine, Italy, Artini, Rend. Accad. Linc., **3** (2), 416, 1894. Allchar, Macedonia, Vrba, Ber. Ak. Böhm. Dec. 7, 1894. Schlaining, Hungary, new forms

**𝔟** (034), **𝔄** (10·9·15), **𝔴** (12·19·3), **𝔰** (40·19·10), **𝔯** (563), A. Schmidt, Zs. Kr., **29**, 196, 1897. Brixlegg, Tyrol, Worobieff, Zs. Kr., **31**, 52, 1899.

Heat conductivity measured, F. B. Peck, Zs. Kr., **27**, 316, 1896.

STILBITE, p. 583.—Crystals from the Tulferthal, Tyrol, described, Habert, Zs. Kr., **28**, 243, 1897.

Change in physical and chemical characters brought about by the action of sulphuric acid, Rinne, Jb. Min., 1, 41, 1897. The name *metadesmine* (p. 58) is given to the forms resulting from more or less complete dehydration; the chemical and physical changes are found to go on together.

See *Sphærostilbite.*

STILPNOMELANE, p. 658.—Occurs at the Wallbridge mine, Madoc, Hastings Co., Ontario; Also on Partridge Is., Nova Scotia. Hoffmann, Rep. G. Canada, 7, 15R.

STOLZITE, p. 989.—Crystals from Loudville, Mass., described by Emerson are hemihedral with the forms: (120), (130), (101), (111), (131), (342). Bull. U. S. G. Surv., **126**, 163, 1895.

Crystals from the Broken Hill mines, New South Wales, described by C. Hlawatsch, show the new forms: *a* (100), *Ω* (1·0·10) ?, *α* (109), *τ* (103), *o* (102), *η* (203), *h* (304), *ε* (201), *π* (133), *A* (155). Axis $\dot{c} = 1·5606$. Optically −. Indices $\omega_y = 2·2685$, $\epsilon_y = 2·182$. Analysis by Treadwell. Zs. Kr., **29**, 130, 1897.

On rounded faces, etching-figures, etc., Hlawatsch, Zs. Kr., **31**, 1, 1899.

STRIGOVITE, p. 659.—Analysis, Grand Marais, Minn., Berkey 23d Ann. Rep't Minn. G. Surv., p. 197.

STROMEYERITE, pp. 56, 1048.—Occurs at the Silver King mine, Toad Mt., Yale district, Br. Columbia (anal. by Johnston), Hoffmann, Rep. G. Canada, 8, 13R, 1895.

STRONTIANITE, pp. 285, 1048.—Occurs in Nepean township, Carleton Co., Ontario, Hoffmann, Rep. G. Canada, 6, 22R, 30R, 1892–93 At Lubna, near Rakonitz, Bohemia, Eichleiter, Vh. G. Reichs., 297, 1898.

SUCCINITE, p. 1004.—See investigations on succinite and related resins by Dahms, Schrift. Ges. Danzig, 8, Nos. 3–4, p. 97, 1892; 9, No. 2, 1, 1895. Also Aweng [Arch. f. Pharm., **232**, 660, 1894], Jb. Min., **2**, 254 ref., 1896; Helm [*ibid.*, **233**, 191, 1895], Jb. Min., **2**, 255, 1896. Also Monograph. d. baltisch. Bernsteinbäume, H. Conwentz, Danzig, 1890.

See also *allingite*, *burmite*, *cedarite*, etc.

**Sulfoborite.** See *Sulphoborite.*

**Sulphoborite.** Sulfoborit, *H. Naupert* and *W. Wense*, Ber. Ch. Ges. **26**, 874, 1893. *H. Bücking*, Ber. Ak. Berlin, 967, 1893.

Orthorhombic. Axes $\breve{a} : \bar{b} : \dot{c} = 0·6196 : 1 : 0·8100$. Observed forms: *b* (010), *c* (001), *m* (110), *r* (101), *o* (111). Angles: $mm''' = 63° 34'$, $oo' = {*}90° 53'$, $oo^{iv} = {*}66° 4'$, $oo'' = 113° 56'$, $oo''' = 52° 24'$. In small prismatic crystals of varying habit.

Cleavage: *m* rather perfect; *c* less so. Brittle. H. = 4. G. = 2·38–2·45 Naupert and Wense; 2·416 Thaddéeff, also clear cryst. 2·440. Luster dull on *c*. Colorless or reddish on the exterior ($Fe_2O_3$). Transparent. Optically −. Ax. pl. ∥ *b*. $Bx_a \perp c$. $2H_{a.y} = 79° 36'$, $2H_{o.y} = 85° 4'$ Na. $\therefore \beta_y = 1·5396$, also $\alpha_y = 1·5272$, $\gamma_y = 1·5443$.

Composition, $2MgSO_4.4MgHBO_3.7H_2O$ Thaddéeff; Naupert and Wense obtained $3MgSO_4.2Mg_3B_4O_9 + 12H_2O$. Analyses, 1, Naupert and Wense; 2 Thaddéeff, Zs. Kr., **28**, 264, 1897.

| | $SO_3$ | $B_2O_3$ | MgO | $H_2O$ |
|---|---|---|---|---|
| 1. | 21·95 (½) | [23·64] | 32·91 | 21·50 = 100 |
| 2. | 22·46 | 19 79 | 33·48 | 23·43 (ign.), $H_2O$ 0·10 (110°–170°), $Fe_2O_3$ 0·11, insol. 0·32 = 99·69 |

B.B. fuses with intumescence, coloring the flame green; reacts for sulphur with soda on charcoal. Dissolves rather readily in mineral acids.

From the salt mines of Westeregeln, where it occurs with anhydrite, carnallite, kieserite, celestite, eisenboracite, etc.

SULPHOHALITE, p. 917.—Van't Hoff and Saunders suggest doubts as to the existence of this species on the insufficient grounds: (1) since they failed to obtain it synthetically; and (2) since specimens furnished as sulphohalite by a dealer proved to be simply halite. Ber. Ak. Berlin, p.

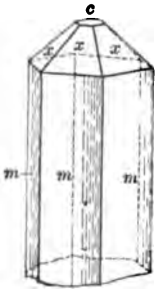
392, 1898. Penfield, however, has examined (priv. contr.) the original specimen and finds it to be homogeneous and to contain both sulphate and chloride of sodium. A new analysis will be made.

SULPHUR, pp. 8, 1048.—**Cryst.**—Milo; Roisdorf, new form *f* (151); Bassick, *η* (553); Comil, near Cadiz, twins, tw. pl. (101), Busz, Zs. Kr., **20**, 558 *et seq.*, 1892. Allchar, Macedonia, new form *k* (122), Pelikan, Min. petr. Mitth., **12**, 344, 1892; also Vrba, Ber Ak. Böhm., Dec 7, 1894. Schlaining, Hungary, occurring with stibnite, Schmidt, Zs. Kr., **29**, 207, 1897. Buggeru, Sardinia, new forms, *φ* (305), *μ* (319), *λ* (155), Millosevich, Riv. Min. Ital., **21**, 48, 1898.

Occurs in the Upper Helderberg limestone of Monroe Co., Mich., Sherzer, Am. J. Sc., **50**, 246, 1895. Occurrence in Texas, E. A. Smith, Science, **3**, May 1, 1896.

Method of formation of the third allotropic form (monoclinic), Salomon, Zs. Kr., **30**, 605, 1899.

**Sundtite.** *W. C. Brögger*, Zs. Kr., **21**, 193, 1893.—See *Andorite.*



Svabite.

SVABITE, p. 1052.—Further described by Hj. Sjögren, G. För. Förh., **13**, 789, 1891: **17**, 313, 1895; Bull. G. Inst. Upsala, **1**, 50, 1892. Occurs well crystallized at the Harstig mine, Pajsberg; also in minute crystals, but usually massive, at the Jakobsberg mine, near Nordmark, Sweden. Composition essentially $Ca_4(CaF)As_3O_{12}$, or analogous to that of apatite, with which it agrees in form; F partly replaced by Cl and (OH), Ca partly by Pb, Mg and alkalies. Analyses, R. Mauzelius, quoted by Sjögren, Bull. G. Inst. Upsala, **1**, 54: 1, G. = 3·77; 2, G. = 3·82.

| | $As_2O_5$ | $P_2O_5$ | CaO | PbO | FeO | MnO | MgO | $Na_2O$ | $K_2O$ | $SO_3$ | Cl | F | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Jakobsberg | 51·05 | 0·38 | 42·07 | 3·02 | 0·08 | 0·26 | 0·52 | 0·56 | 0·30 | 0·69 | 0·12 | 1·99 | 0·25 = 101·29 |
| 2. " | 50·92 | *tr.* | 37·22 | 4·52 | 0·14 | 0·19 | 3·90 | 0·39 | 0·28 | 0·57 | 0·08 | 2·80 | 0·33 = 101·34 |

Svabite appears to belong distinctly to the Apatite Group; its relationship is shown not only in the similarity of angle, but also in the symmetry of the form as indicated by traces of a hexagonal prism of the third order (cf. Fig.).

SYLVANITE, p. 103.—From Nagyág, Vrba, Ber. Ak. Böhm, Dec. 7, 1894.

Occurs at Kalgoorlie, West Australia. G. = 8·14, Ag = 3·82 p. c. Frenzel, Min. petr. Mitth., **17**, 288, 1897.

Occurs at Cripple Creek, Colorado. See *Calaverite*, *Krennerite*, and *Goldschmidtite.*

SYLVITE, pp. 156, 1036, 1049.—Refractive indices for long waves, Rubens and Snow, Wied. Ann., **46**, 529, 1892.

Dispersion and absorption in infra-red, Rubens and Trowbridge, Wied. Ann., **60**, 724, 1897, and Am. J. Sc., **5**, 33, 1898.

Stassfurt, analysis by W. Schimpff, Zs. Kr., **25**, 92, 1895.

SYNGENITE, p. 945.—Optical constants determined, Mügge, Jb. Min., **1**, 266, 1895.

TACHHYDRITE, p. 178.—Discussion of conditions of formation and of alteration, van't Hoff and Meyerhoffer, Ber. Ak. Berlin, 508, 1897.

On the synthesis of isomorphous compounds, A. de Schulten, Bull. Soc. Ch., **17**, 165, 1897.

TALC, p. 678.—From the dolomite of Canaan, Conn., rose-colored, analysis by L. Kahlenberg: $SiO_2$ 61·48, $Al_2O_3$ 3·04, MgO 25·54, CaO 4·19, FeO 0·77, MnO *tr.*, $H_2O$ 5·54 = 100·56. See Hobbs, Am. J. Sc., **45**, 404, 1893.

On the origin (from enstatite and tremolite) of the fibrous talc of northern New York, C. H. Smyth, Sch. Mines Q., **17**, 333, 1896; see Am. Geol., **10**, 44, 1892.

Talc, pseudomorphous after pectolite, has been called *stevensite* by Leeds, cf. Chester, Dictionary Names Minerals, 257, 1896.

A fibrous variety perhaps pseudomorphous has been called *beaconite* by L. W. Hubbard, Rep't State Bd. Geol. Surv. Michigan, 1891–92, p. 171 (Lansing, 1893). Resembles asbestus; β = 1·5–1·6; 2V = 60° (Lane). G. = 2·74–2·88. Analysis gave Packard: $SiO_2$ 59·72, $Fe_2O_3$,FeO 8·67, MnO 0·64, MgO 26·42, ign. 4·13 = 99·58; formula deduced $H_2(Mg,Fe)_3(SiO_4)_3$. From the Champion mine, Beacon P. O., Michigan.

A magnesium silicate near talc in composition occurs in irregular veins and streaks of a bright blue color in silver-bearing limestone near Silver City, New Mexico. As separated it is dull, earthy, resembling vivianite. An analysis gave: $SiO_2$ 62·43, MgO 28·53, ign. 6·47, $Al_2O_3$ 0·25, FeO 0·99, $Na_2O$ 0·14, $K_2O$ 0·16 = 98·97. R. L. Packard, Proc. Nat. Mus., **17**, 19, 1894. This mineral has been called *native ultramarine.*

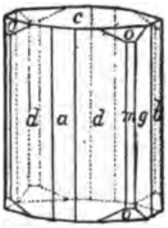
**Talkknebelite**, Talc-knebelite. *L. J. Igelström*, Jb. Min., **1**, 248, 1890.—See *Knebelite.*

**Tantalite**, pp. 731 *et seq.*—Crystals from Paris, Me., with G. = 7·26, agree closely with columbite in angles (Fig. 1); forms *a, b, c, m, d* (730), *g* (130), *o* (111), *n* (163), C. H. Warren, Am. J. Sc., **6**, 123, 1898. These results show the correctness of the position taken in Dana's Min. (l. c.) in regard to the relation of true tantalite and columbite, as also of the former to "skogbölite" and "ixiolite." Brögger has now proved, further, that the supposed orthorhombic iron tantalite (skogbölite of Nordenskiöld), which most authors have vainly tried to bring into correspondence in form with columbite, is in fact tetragonal and identical with *tapiolite*. The crystals (Figs. 1, 2, Min., p. 736) are twins elongated parallel to *e* (101) as tw. plane (*r* = 111, etc.). In axial ratio and habit they correspond to mossite (this Append., p. 48). Vid. Skrift. I, Math.-nat. Klasse, No. 7, 1897, Christiania. See also *Tapiolite*.

Analysis from Finland, Khrushchov, Vh. Min. Ges., **31**, 415, 1894.

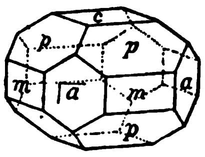
See also *Mossite*.

1.



**Tapiolite**, p. 738.—Crystals, in part twins (Figs. 1, 2), with G. = 7·67–7·68, occur at Topsham, Me., C. H. Warren, Am. J. Sc., **6**, 121, 1898. The twins are elongated ∥ *e* (tw. pl.), similarly to some rutile, cf. Min., p. 1047. Similar twins exist with the tapiolite of Norway formerly called tantalite (skogbölite), see *Tantalite*.

1.



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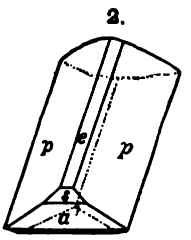

Tapiolite, Topsham, Me.

**Taraspite.**—A variety of dolomite from Tarasp, Switzerland, apparently the same as miemite (Min., p. 271), cf. C. v. John, Vh. G. Reichs., 67, 1891.

**Taylorite.**—This name (already in use, Min., p. 895) has been given by W. C. Knight (Eng. Mng. J., **63**, 600, 1897) to an unctuous, greenish-yellow to cream-colored clay with G. = 2·132; composition variable. Forms beds in the Cretaceous shales of Rock Creek, Albany Co., Wyoming.

**Tennantite**, pp. 137, 1049.—A massive variety occurs at the Mollie Gibson mine, Aspen, Colorado associated with polybasite (see p. 54, this Appendix). Analysis. Penfield: (G. = 4·56), S 25·04, As 17·18, Sb 0·13, Cu 35·72, Ag 13·65, Zn 6·90, Fe 0·42, Pb 0·86 = 99·90. Also stated to occur near Central City and at the Freeland lode and Crocett mine, Idaho Springs, Colorado. Penfield and Pearce, Am. J. Sc., **44**, 18, 1892.

Occurs in Barrie township, Frontenac Co., Quebec, Hoffmann, Rep. G. Canada, **6**, 28R, 1892–3. Also at the Avoca claim, Bonaparte river, Lillooet distr., Br. Columbia, *ibid.*, **9**, 13R, 1896.

See also *Binnite;* which is stated to be identical with tennantite.

**Tetradymite**, p. 39.—Analyses by W. Muthmann and E. Schröder, of specimens from Orawitza and Schubkau give the same composition, $Bi_2(Te,S)_3$ or $2Bi_2Te_3.Bi_2S_3$. Zs. Kr., **29**, 140, 1897. Analyses below after deducting gangue, in 1, 11 p. c.; in 2, 0·5 p. c.

Occurs with altaite and hessite near Liddell creek, Kaslo river, West Kootanie, Br. Columbia, Hoffmann, Rep. G. Canada, **8**, 10R, 1895. Analysis by Johnston (3 below after deducting 3·5 p. c. quartz).

| | G | Te | Se | S | Bi |
|---|---|---|---|---|---|
| 1. Orawitza | 7·095 | 35·43 | — | 4·49 | 59·14 = 99·06 |
| 2. Schubkau | | 35·43 | *tr.* | 4·31 | 60·23 = 99·97 |
| 3. Br. Columbia | | 37·29 | *tr.* | 4·45 | 53·69 Pb 3·63, Ag 0·94, Tl *tr.* = 100. |

**Tetragophosphite.** *L. J. Igelström*, Zs. Kryst., **25**, 433, 1895. A supposed new phosphate resembling lazulite, occurring at Horrsjöberg in a quartzose rock carrying cyanite. In four-sided tabular crystals; color bright blue; transparent. Two analyses gave somewhat discordant results:

| $P_2O_5$ | $Al_2O_3$ | FeO,MnO | Mg,CaO | $H_2O$ |
|---|---|---|---|---|
| 36·92 | 40·00 | 9·51 | 7·50 | 5·96 = 99·89 |
| 33·64 | 41·81 | 9·51 | 6·54 | 8 30 = 100 |

**Tetrahedrite**, p. 137.—Crystals from Framont described with new forms, (7$\bar{7}$1), (11·$\bar{1}$1·2), (21·20·20), Brunlechner [Inaug. Diss., Strassburg, 1892], Zs. Kr., **24**, 628, 1895.

A variety containing lead (9·38 p. c. Pb) occurs at the Antelope claim, West Kootanie, Br. Columbia (anal. by Johnston), Hoffmann, Rep. G. Canada, **7**, 12R, 1894. Occurs also (3·09 p. c. Ag) near Sicamous, Shuswap Lake, Br. Columbia, Hoffmann, Rep. G. Canada, **5**, 65R, 1889–90. With gold ores of California, Turner and Lindgren, Am. J. Sc., **49**, 379, 1895.

Specific heat determined, also of other sulphur compounds, A. Sella. Nachr. Ges. Göttingen, 311, 1891.

**Thalénite.** *Benedicks*, G. För. Förh., **20**, 308, 1898.

Monoclinic. Axes $\breve{a} : \bar{b} : \dot{c} = 1·154 : 1 : 0·602$; $\beta = 80·2°$. Forms: *a* (100), *b* (010), *c* (001), *m* (110), *f* (021), *e* (111), *d* ($\bar{1}11$), *k* (311). Angles: $am = 48·7°$, $a'd = 73° 0'$, $bd = 55·7°$. Crystals tabular ‖ *a*, in part prismatic ‖ $\dot{b}$.

Cleavage none. Fracture uneven to splintery. Brittle. H. = 6·5. G. = 4·227. Color flesh-red. Optically –. Ax. pl. nearly ⊥ $\dot{b}$. $Bx_a \perp a$ (100). Indices for Na, $\alpha = 1·7312$, $\beta = 1·7375$, $\gamma = 1·7436$. $2H_{a.y} = 81° 36'$, ∴ $2V_{a.y} = 67° 35'$.

Composition, $H_2Y_4Si_4O_{15}$ or $H_2O.2Y_2O_3.4SiO_2$. Analyses: 1, of fresh material; 2, of weathered material.

| | $SiO_2$ | $Y_2O_3$[a] | $Fe_2O_3$ | $Al_2O_3(BeO)$ | CaO | MgO | $Na_2O$ | SnO | $H_2O$ | $CO_2$ | X[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 29·88 | 63·35 | 0·30 | 0·45 | 0·49 | 0·21 | 0·26 | 0·28 | 2·08 | 1·04 | 1·40 = 99·69 |
| 2. | 27·69 | 58·58 | 1·51 | 0·35 | 2·19 | 0·40 | 1·07 | 0·22 | 2·70 | 3·32 | 2·50 = 100·53 |

[a] $R_2O_3 = 245·3$ [b] Helium, etc.

The numbers given are the mean of two to five determinations.

Occurs with fluocerite at Österby in Dalecarlia, Sweden. Named after Prof. R. Thalén. Related to yttrialite (Min., p. 512), rowlandite (p. 1047), etc.

THALITE, p. 682.—Examined by N. H. Winchell (anal., Pease), Amer. Geol., **23**, 41, 1899.

THAUMASITE, p. 698.—From West Paterson, N. J., described by Penfield and Pratt. Occurs in trap associated with pectolite, apophyllite, and various zeolites. Forms a loose aggregate of prismatic crystals (hexagonal). G. = 1·875–1·887. Color white. Index $n_y = 1·5125$Na. Analysis:

| | $SiO_2$ | $CO_2$ | $SO_3$ | CaO | $H_2O$ | $Na_2O$ | $K_2O$ |
|---|---|---|---|---|---|---|---|
| (½) | 9·26 | 6·82 | 13·44 | 27·13 | 42·77 | 0·39 | 0·18 = 99·99 |

This agrees closely with earlier results. As regards the water, 13 molecules go off at 150° and are regarded as being water of crystallization, hence the formula $[(CaOH)CO_3].[(CaOH)SO_3].[(CaOH)HSiO_4] + 13H_2O$. Am. J. Sc., **1**, 229, 1896.

Also described by Bäckström from Skottvång, Nyköping, Sweden; associated with apophyllite, G. För. Förh., **19**, 307, 1897.

See also note by Pisani, Bull. Soc. Min., **19**, 85, 1896.

THENARDITE, p. 895.—Pseudomorphs after mirabilite from Aussee in the Salzkammergut are described by Pelikan; also pyramidal crystals *r* (111) with the new forms *v* (113) and *u* (130); these yield the mean axial ratio, $\breve{a} : \bar{b} : \dot{c} = 0·5970 : 1 : 1·2541$. Min. petr. Mitth., **12**, 476, 1891.

THOMSONITE, pp. 607, 1050.—Crystals from the Tulferthal, Tyrol, described, Habert, Zs. Kr., **28**, 254, 1897.

See also *Bagotite* and *Lintonite*.

THORITE, pp. 488, 1050.—Crystals from Arendal, described with *c* (001), Hamberg, G. För. Förh., **16**, 327, 1894.

Occurs in granite of the Trotter mine, Franklin Furnace, N. J., Kemp, Trans. N. Y. Acad. Sc., **13**, 76, 1893.

**Tiffanyite.** *G. F. Kunz*, Trans. N. Y. Acad. Sci., **14**, 260, 1895. A name proposed for a hydrocarbon assumed to be present in certain diamonds, namely, those which, on this account, exhibit fluorescence and phosphorescence. The substance apparently has a bluish-white color.

**Tilasite**, Fluor-Adelite. *H. Sjögren*, G. För. Förh., **17**, 291, 1895. Massive, granular. Cleavage in one direction (*A*) distinct, in three others (*B*, *C*, *D*) less so. G. = 3·28. Luster resinous, on cleavage-surfaces vitreous. Color gray with a tinge of violet. A section ‖ *A* and $Bx_a$ shows the ax. plane inclined 19° to *B* and 28° to *C*.

Composition $(MgF)CaAsO_4$, or analogous to adelite (p. 1) with fluorine instead of hydroxyl. Analysis, Mauzelius:

| $As_2O_5$ | $P_2O_5$ | FeO | MnO | CaO | MgO | $Na_2O$ | $H_2O$ | F | Cl |
|---|---|---|---|---|---|---|---|---|---|
| 50·91 | *tr.* | 0·14 | 0·16 | 25·32 | 18·22 | 0·29 | 0·28 | 8·24 | 0·02 = 103·58 less (O = F) 3·47 = 100·11 |

Occurs at Långban, Sweden, with berzeliite and calcite in veins in the manganiferous (hausmannite) dolomitic limestone. Named after the Swedish mining engineer, Daniel Tilas.

TITANITE, p. 712.—Crystals from Lauvitel, Isère, France, show the new forms ($\bar{5}·3·20$) and (883), Termier, Bull. Soc. Min., **19**, 81, 1896. Crystals from Tyrol, Weinschenk, Zs. Kr., **26**, 502, 1896.

Pyroelectricity investigated, Traube, Jb. Min., Beil.-Bd., **11**, 209, 1897.

Occurs as a prominent constituent of the "titanite-gneiss" from near the Brenner Pass in Tyrol, Rodewyk, Min. petr. Mitth., **17**, 544, 1897.

Artificial formation, Michel, C. R., **115**, 830, 1892.

See also *Neptunite*.

Topaz, p. 492.—**Cryst.**—Alabashka, new form (338), Jeremejev, Vh. Min. Ges. St. Pet., **27**, 439, 1891, and Zs. Kr., **22**, 74, 1893. Ilmen Mts., new forms (290), (580), (415), (10·3·13), (8·7·15), (116)?, and others doubtful, Souheur, Zs. Kr., **20**, 232, 1892. Japan, Matthew, Sch. Mines Q., **14**, 53, 1892. Japan and New South Wales, Hahn, Zs. Kr., **21**, 334, 1893. Mino, Japan, T. Hiki, J. Coll. Sc. Japan, **9**, 69, 1895. Köhlerloh quarry near Reenersreuth, Fichtelgebirge, forms (9·9·20), (1·11·12)?, Bücking, Ber. Senckenberg. Ges., 147, 1896. Crystals in collection of U. S. National Museum, Eakle, Proc. U. S. Nat. Museum, **21**, 361, 1898.

Investigation of inclusions, Tolstopiatov, Vh. Min. Ges., **33**, 289, 1895.

Ilmen Mts. and Adun Chalon, optical characters determined, Thaddéeff, Zs. Kr., **23**, 536, 1894.

Occurs abundantly in colorless crystals in alluvial sands of district of Batang Padang, Perak, Lacroix and Sol, C. R., **123**, 135, 1896. Occurs near Palestine, Texas, in rolled crystals, Kunz, Trans. N. Y. Acad. Sc., **13**, 144, 1894, and Am. J. Sc., **47**, 403, 1894.

Synthetic experiments, A. Reich, Ber. Ak. Wien, **105** (2), 105, 1896; Monatsh. f. Chemie, **17**, 149, 1896.

By a series of accurate analyses, Penfield and Minor (Am. J. Sc., **47**, 387, 1894) have shown that the ratio for $SiO_2 : Al_2O_3 : F + OH$ is constant, viz. = 1 : 1 : 2, but the amounts of fluorine and hydroxyl vary widely. This ratio gives the formula $[Al(F,OH)]_2SiO_4$ or $Al(F,OH)_2AlSiO_4$. With the change in the relative amounts of fluorine and water vary also the specific gravity, crystallographic axes, and optical characters. Crystals from the Thomas Range, Utah, contained almost no water (0·19 p. c. with 20 37 F); they have G. = 3·565, $2E_y = 125° 53'$ and $\gamma - \alpha = 0·0104$. Crystals from Minas Geraes, Brazil, gave 2·45 $H_2O$ and 15·48 F; for them G. = 3·532, $2E = 84° 28'$ and $\gamma - \alpha = 0·0081$. Between these extremes fall crystals from Colorado, Japan, Siberia, Saxony, Maine. The presence of water has also been determined by Jannasch and Locke, Zs. anorg. Ch., **6**, 168, 321, 1894, and Am. J. Sc., **47**, 386, 1894.

Torbernite, p. 856.—Etching-figures indicate monoclinic symmetry T. L. Walker, Am. J. Sc., **6**, 41, 1898.

Tourmaline, pp. 551, 1050.—From Elba, monographs on the crystallization (new forms (2·0·$\bar{2}$·11) and (5·1·6·1)) and physical characters, especially the refractive indices, also pleochroism, specific gravity, hardness, etc. G. D'Achiardi, Att. Soc. Tosc., Mem., Pisa, **13**, 229, 1894, also Proc. Verb., March 4, 1894, and **15**, 1896. Isola del Giglio, investigation of sections | $\dot{c}$, showing zonal structure, *idem*, Annal. Univ. Tosc., **22**, 1897.

Etching-figures investigated, Traube, Jb. Min., Beil.-Bd., **10**, 460, 1896; also Walker, Am. J. Sc., **5**, 178, 1898. Secondary enlargement in itacolumite, Derby, Am. J. Sc., **5**, 190, 1898.

Dichroism for infra-red waves, E. Merritt, Wied. Ann., **55**, 49, 1895.

**Anal.**—Urulga, Siberia, Prendel, Zs. Kr., **20**, 93, 1892. Kuhrau, Bohemia, Katzer; also from Benitz, Formánek, Min. petr. Mitth., **12**, 420, 1892. Nevada Co., California, W. H. Melville, Bull. U. S. G. Surv., **90**, 39, 1892. Caprera, Fasolo quoted by Lovisato, Rend. Accad. Linc., **4** (1), 84, 1895.

Occurrence of tourmaline schists, Belcher Hill, Colorado, H. B. Patton, Bull. G. Soc. Amer., **10**, 21, 1899.

Comp.—Penfield and Foote (Am. J. Sc., **7**, 97, 1899), on the basis of two new analyses of widely different varieties (quoted below) which were carried through with great care on material of absolute purity, and also after a discussion of many other trustworthy analyses, arrive at the conclusion that all varieties of tourmaline can be referred to the aluminium-borosilicic acid $H_9Al_3(B.OH)_2Si_4O_{19}$. More simply put, the acid derived is $H_{20}Bi_2Si_4O_{21}$, the ratio of $H : B_2O_3 : SiO_2$ being 20 : 1 : 4. The constant relation between the boron and silicon deduced by other analysts is fully confirmed. Of the analyses of others (for the most part quoted in Min., pp. 554, 555) the series by Riggs agree closely with the above ratio; this is also true of those by Jannasch and Kalb; the analyses by Rammelsberg are (as stated by him) low in water and require correction for the oxidation of the iron. Corrected in these points they also conform to the above ratio. The new analyses by Penfield and Foote are:

| | G | | $SiO_2$ | $TiO_2$ | $B_2O_3$ | $Al_2O_3$ | FeO | MnO | MgO | CaO | $Na_2O$ | $K_2O$ | $Li_2O$ | $H_2O$ | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. DeKalb, *colorless* | 3·049 | § | 36·72 | 0·05 | 10·81 | 29·68 | 0·22 | — | 14·92 | 3·49 | 1·26 | 0·05 | — | 2·98 | 0·98=101·11 |
| | | | | | | | | | | | | | | deduct (F= O) | 0·39=100·72 |
| 2. Haddam Neck, *green* | 3·089 | § | 36·96 | 0·03 | 11·00 | 39·56 | 2·14 | 2·00 | 0·15 | 1·28 | 2·10 | — | 1·64 | 3·10 | 1·13=101·09 |
| | | | | | | | | | | | | | | deduct (F= O) | 0·48=100·61 |

The composition has been also discussed by Kenngott, Jb. Min., **2**, 44, 1892, and by Rheineck, Zs. Kr., **22**, 52, 1898.

Triphylite, p. 756.—The influence of varying amounts of iron and manganese in triphylite and lithiophilite has been minutely investigated by Penfield and Pratt, Am. J. Sc., **50**, 387, 1895.

**Tripuhyite.** *E. Hussak* and *G. T. Prior*, Min. Mag., **11**, 302, 1897

In fragments in gravel, these are micro-crystalline aggregates. G.=5·82. Color dull greenish yellow. Streak canary-yellow, Translucent. Refringence and birefringence high. Biaxial.

Composition, probably $2FeO.Sb_2O_5$. Analysis, Prior :

| $Sb_2O_5$ | FeO | CaO | $SiO_2$ | $Al_2O_3$ | $TiO_2$ |
|---|---|---|---|---|---|
| 66·68 | 27·70 | 0·82 | 1·35 | 1·40 | 0·86 undet. 1·19 = 100 |

From the cinnabar-bearing gravels of Tripuhy near Ouro Preto, Minas Geraes, Brazil. Associated with the new species lewisite and derbylite ; also xenotime, monazite cyanite, rutile, hematite, magnetite, etc.

TROILITE, pp. 72, 1051.—See *Pyrrhotite.*

TSCHEFFKINITE, p. 718.—On the occurrence in India, see Mallet, Rec. G. Surv. India, **25**, 123, 1892. The original locality is shown to be Kanjamalai Hill in the Salem district, Southern India.

TURQUOIS, p. 844.—Analyses from New Mexico and Persia, Carnot, Bull. Soc. Min., **18**, 119, 1895.

Occurs in the Jarilla Mts., Doña Ana Co., N. M., Hidden, Am. J. Sc., **44**, 400, 1893.

TYROLITE, p. 839.—Church, working again upon material examined in 1873 (J. Ch. Soc., **27**, 108) seems to prove that the mineral (from Falkenstein or Libethen?) in fact contains $CaCO_3$ (11 p. c.) as an essential ingredient ; of the total water (15·68 p. c.) 5·23 p. c. was lost in vacuo and 2·40 at 100° C. Min. Mag., **11**, 5, 1895.

TYSONITE, p. 166.—Analysis, Colorado, Hillebrand, Am. J. Sc., **7**, 51, 1899.

A partially described yttrium-calcium fluoride occurs with the astrophyllite of W. Cheyenne Cañon, El Paso, Colorado, Genth and Penfield, Am. J. Sc., **44**, 386, 1892. Granular, crystalline, cleavable. H. = 4. G. = 4·316. Color white, grayish or reddish white. Analysis (Genth) gave: $(Y,Er)_2O_3$ 47·58 (at. wght. 126), $CeO_2$ 0·83, $(La,Di)_2O_3$ 1·55, CaO 19·41, ign. 1·57, $Fe_2O_3$, F, etc., *undet.* The formula suggested is $CaF_2.(Y,Er,Ce,La,Di)F_3$.

UINTAITE, p. 1020.—For description of the occurrence and properties of this hydrocarbon (also called *gilsonite*), see Locke, Trans. Am. Mng. Eng., **17**, 162, 1888, and Eldridge, U. S. G. Surv., 17th Ann. Rep., Part. I, pp. 915–945, 1896.

URANINITE, p. 889. — The varieties *cleveite* and *bröggerite* yield helium (and other gases), Ramsay, Proc. Roy. Soc., **58**, 65, 81, 1895 ; **59**, 325, 1896. Also Ramsay and Travers, *ibid.*, **60**, 443, 1897. Lockyer, *ibid.*, **58**, 67, 113, 116, 192, 193 ; **59**, 4, 1895 ; **59**, 342, 1896 ; (and other minerals) **60**, 133, 1896. Tilden, *ibid.*, **59**, 218, 1896 Langlet, Oefv. Ak. Stockh., **52**, 211, 1895.

Regarded as containing the new substances polonium and radium, M. and Mde. P. Curie and G. Belmont, C. R., **127**, 175, 1215, 1898

Analyses, Llano Co., Texas ; Marietta, S. C., Villeneuve, Quebec, Johanngeorgenstadt, W. H. Hillebrand, Bull. U. S. G. Surv., **90**, 22, 1892.

URANOTIL, p. 699.—On the crystalline form (triclinic), Pjanitzky, Zs. Kr., **21**. 74, 1892, also Jb. Min., **2**, 249 ref., 1896.

**Urbanite.** *Hj. Sjögren*, G. För. Förh., **14**, 251, 1892 ; Bull. G. Inst. Upsala, **2**, 77, 106, 1894. Lindesite, *L. J. Igleström*, Zs. Kr., **23**, 590, 1894.

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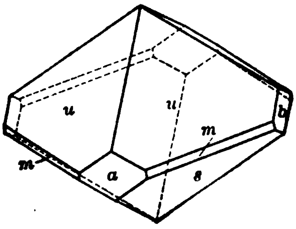

Monoclinic, belonging to the Pyroxene Group. Axes (Sjögren), $\breve{a} : \bar{b} : \dot{c} = 1·1009 : 1 . 0·6058$, $\beta = 72° 7'$. Forms : *a* (100), *b* (010), *m* (110), *p* ($\bar{1}01$), *r* (053), *u* (111), *n* (221), *s* (111), *o* ($\bar{2}21$): also doubtful, *x* ($\bar{3}22$ or 433), *y* ($\bar{6}14$). Angles : $mm''' = 92° 40'$, $uu' = 48° 28'$, $mu = 44° 5'$, $m's = 59° 6'$ (calc., Sj.).

Habit pyramidal, *u*, *s* prominent (Fig. 1). Cleavage, prismatic (*m*) distinct ; *c* less so. H=. 5–6. G.= 3·52 (L.), 3·53 (G.). Luster vitreous. Color brownish black (L.), chestnut-brown (G.). Streak light brown. Faintly translucent. Strongly pleochroic. $\mathfrak{a}$ brown, $\mathfrak{b}$ yellow-brown, $\mathfrak{c}$ yellow. Ax. pl. | *b* (010). $\mathfrak{a} \wedge \dot{c} = + 16°$ (L.) to 22° (G.).

In composition a metasilicate corresponding to $(Ca,Mg)SiO_3$ (diopside) + $2\,Na\overset{\text{iii}}{Fe}(SiO_3)_2$ (acmite). Analyses, R. Mauzelius, quoted by Sjögren (Bull. G. Inst. Upsala, l. c.) :

|  | $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Långban | 51·61 | — | 0·74 | 27·24 | 0·54 | 1·73 | 4·90 | 2·75 | 0·36 | 10·59 | 0·90=101·36 |
| 2. Glakärn | 49·21 | 0·06 | 1·27 | 25·35 | 0·50 | 6·71 | 5·68 | 1·39 | 0·40 | 8·95 | 1·05 F 0·20=100·77 |

B.B. fuses with difficulty to a magnetic slag. Only slightly attacked by acids.

Occurs at Långban, Sweden, in cavities in granular hematite. This mineral was apparently earlier (1865) mentioned by Breithaupt and analyzed by Winkler (cf. Sjögren). It had been confounded with schefferite (iron-schefferite). Also found at Glakärn, province of Örebro, as idiomorphic grains in a mixture of yellowish-white feldspar and rhodonite. This mineral was partly investigated by Igelström (l. c.) and called *lindesite*. Named after the Swedish investigator Urban Hjärne.

**Utahlite.**—See *Variscite.*

VALERIITE, p. 108.—Shown by Petrén to be a mixture of covellite, pyrrhotite, hydrotalcite, siderite, spinel and probably limonite, G. För. Förh., **20**, 183, 1898.

**Valléite.** *G. Cesàro*, Bull. Acad. Belg., **29**, 508, 1895; **32**, 536, 1896. A colorless or pale-red orthorhombic amphibole accompanying the violet tremolite of Edwards, N. Y. In prismatic crystals with *a* (100), *m* (110), *x* (920)?, (021)?; *mm‴* = 54° 30′. Cleavage *m*, also (according to the author) parallel to the pinacoids, and several brachydomes. H. = 4·5. G. = 2·88. Optically negative. Ax. pl. ‖ *b* (010). $Bx_a \perp a$ (100). 2E = 90° 28′, 2V = 51° approx. $\gamma - \beta = 0{\cdot}0036$. Composition $RSiO_3$ or that of anthophyllite, deduced from the analysis by Renard: $SiO_2$ 58·02, MgO 27·99, CaO 5·04, $Fe_2O_3$ 1·28, MnO 2·88, $K_2O$ 0·89, $H_2O$ 3·13 = 99·23. Easily fusible to a white opaque bead. Named after De la Vallée-Poussin.

VARISCITE, p. 824.—From near Lewiston, Cedar Valley, Tooele Co., Utah, compact, nodular or crypto-crystalline, color bright green; analysis, R. L. Packard G. 2·62: $P_2O_5$ 44·40, $Al_2O_3$ [32·65], $H_2O$ 22·95 = 100. Am. J. Sc., **47**, 297, 1894. This variscite has been called *utahlite*, see G. F. Kunz, 16th Ann. Rep't. U. S. G. Surv., 1894–5, Part IV, p. 602.—See also *Wardite.*

VERMICULITES, p. 664.—A hydro-mica, largely but not wholly altered to vermiculite, from Rocky Hill, N. J., has been analyzed by F. W. Clarke and N. H. Darton. It is unusual in containing a large percentage of iron ($Fe_2O_3$), and a ferric muscovite is suggested as part of the unaltered compound. Am. J. Sc., **7**, 365, 1899.

VESUVIANITE, p. 477.—**Cryst.**—Mte. Somma and Zermatt, new forms (observed, except *E*, once only): *T* (106), *S* (229), *V* (552), *W* (14·14·5), *D* (13·5·5), *K* (722), *E* (11·4·4), also (13·13·4)? Boecker, Zs. Kr., **20**, 225, 1892. Vesuvius, P. Franco, Giorn. Min., **4**, 185, 1893; also in full in Boll. Soc. geol. Ital., **11**, No. 2, 1893. Monograph with optical determinations, analyses, discussion of composition, etc., Weibull, Zs. Kr., **25**, 1, 1895. Friedeberg, Silesia, Graber, Min. petr. Mitth., **17**, 384, 1897.

Optical characters fully discussed, Klein, Jb. Min., **2**, 106, 1895.

**Comp.**—Ural, analysis of a chromium-bearing variety (2·31 p. c. $Cr_2O_3$), Sofia Rudbeck, G. För. Förh., **15**, 607, 1893. Harstig (4·81 p. c. MnO) and Vaticha (anal. by Mauzelius), discussion of the composition of the species in general, Hj. Sjögren, G. För. Förh., **17**, 267, 1895. Analyses and discussion of composition, Jannasch and Weingarten, Zs. anorg. Ch., **11**, 40, 1895. Composition discussed, Rammelsberg, Jb. Min., **2**, 157, 1896. See also Weibull, above.

VIOLAN, p. 356.—See *Pyroxene*, p. 57.

VIVIANITE, p. 814.—Occurrence, origin, etc., in province of Drenthe, Netherlands, G. M. van Bemmelen, Arch. Néerland, Harlem, **30**, 25, 1897.

Occurrence in the Mecklenburg moors, A. Gärtner, Arch. Ver. Meckl., **51**, 1897 (and Inaug. Diss., Rostock).

**Wardite.** *J. M. Davison*, Am. J. Sc., **2**, 154, 1896.

Massive, encrusting; with concretionary structure, in part oolitic. H. = 5. G. = 2·77. Luster vitreous. Color light green, bluish green. Streak white.

Composition, $2Al_2O_3.P_2O_5.4H_2O$ or $Al_2(OH)_3PO_4 + \frac{1}{2}H_2O$. Analysis, Davison, l. c.:

| $P_2O_5$ | $Al_2O_3$ | CuO | FeO | MgO | $Na_2O$ | $K_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| 34·46 | [38·25] | 0·04 | 0·76 | 2·40 | 5·98 | 0·24 | 17·87 = 100 |

Occurs encrusting cavities in nodular masses of the variscite from Cedar Valley, Utah (see above). Named after Prof. Henry A. Ward of Rochester, N. Y.

WAVELLITE, p. 842.—Crystals described from Arbrefontaine, Belgium, G. Cesàro, Mem. Acad. Belg., **53**, 1897.

Analyses by Carnot, C. R., **118**, 995, 1894.

Occurs at the Dunellen phosphate mines, Marion Co., Florida, Moses and Luquer, Sch. Mines Q., **13**, 238, 1892.

**Webnerite.** *Stelzner*, Zs. Kr., **24**, 125, 1891.—See *Andorite*.

**Weldite.** *F. M. Krause* [Proc. R. Soc. Tasmania, 1884] quoted by Petterd, Catalogue of Minerals of Tasmania, p. 94, 1896. A white, amorphous substance, containing chiefly silica, alumina and soda, but of undetermined composition. H. = 5·5. G. = 2·98. Occurs with bands of quartzite and is probably derived from the alteration of a felsitic rock. From the Weld river, Upper Huon, Tasmania.

**Wellsite.** *J. H. Pratt* and *H. W. Foote*, Am. J. Sc., **3**, 443, 1897.

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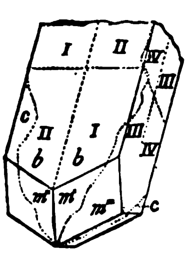

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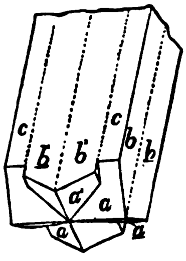

Monoclinic. Axes $a : \breve{b} : \grave{c} = 0·768 : 1 : 1·245$; $\beta = 53° 27' = 001 \wedge 100$. Measured angles: $ac = 53° 27'$, $bm = 58° 19'$, $a\underline{a} = 73° 6'$, $b\underline{b} = 90°$. In complex twinned crystals (Figs. 1, 2) analogous to familiar forms of harmotome and phillipsite, but without striations on the *b*-faces.

Cleavage none. Brittle. H. = 4–4·5. G. = 2·278–2·366. Luster vitreous. Colorless to white. Optically +. Birefringence low. $Bx_a \perp b$ (010). $Bx_o \wedge \grave{c} = -52°$. Ax. angle large.

Composition, $RAl_2Si_3O_{10}.3H_2O$ where R = Ba : Ca : $K_2$ = 1 : 3 : 3. This requires: Silica 42·8, alumina 24·3, baryta 6·6, lime 7·3, potash 6·1, water 12·9 = 100. Wellsite thus falls into the Phillipsite Group, containing less water than the other members (cf. Min., p. 571). It is shown further that it is to be expected that phillipsite should contain $4H_2O$, not $4\frac{1}{2}H_2O$ as usually accepted (see *Phillipsite*).

Analysis:

| | $SiO_2$ | $Al_2O_3$ | BaO | SrO | CaO | MgO | $K_2O$ | $Na_2O$ | $H_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| ½ | 43·86 | 24·96 | 5·07 | 1·15 | 5·80 | 0·62 | 3·40 | 1·80 | 13·35 = 100·01 |

About one molecule of water is given off between 100° and 200°, a second between 200° and 300°, and the remainder at a red heat.

B.B. exfoliates slightly and fuses at 2·5–3 to a white bead. Yields water readily in the closed tube. Easily decomposed by hot hydrochloric acid with separation of silica.

Found in Buck Creek corundum mine in Clay Co., N. C.; occurs in small crystals with chabazite on feldspar, also on corundum. Named after Prof. H. L. Wells of New Haven, Conn.

WERNERITE, p. 468.—As a contact mineral in the Adamello Group and discussion of composition (anal.), Salomon, Min. petr. Mitth., **15**, 159, 1895. It is argued that *dipyre* is to be regarded not as a definite scapolite type but as belonging in part to wernerite, in part to mizzonite.

WESTANITE (Vestanite), p. 499.—Weibull has confirmed Groth's suggestion that the mineral is an altered andalusite. A specimen examined by him showed a nucleus of andalusite surrounded by pyrophyllite. G. För. Förh., **20**, 57, 1898.

**Whartonite.** *S. H. Emmens*, J. Am. Chem. Soc., **14**, No. 7. See *Pyrite*.

WHEWELLITE, p. 993.—Obtained at the Venus mine, near Brüx, Schubert (optical determinations), Min. petr. Mitth., **18**, 251, 1898.

WICKELKAMAZITE. *E. Cohen*, Ann. Mus. Wien, **6**, 157, 1891.

WILLEMITE, p. 460.—Penfield has described colorless prismatic crystals from the Merritt

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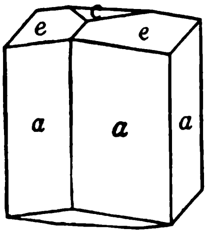

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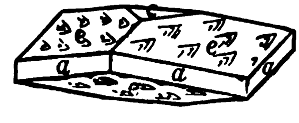

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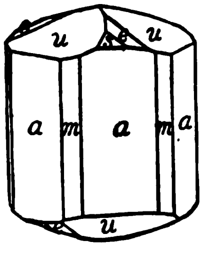

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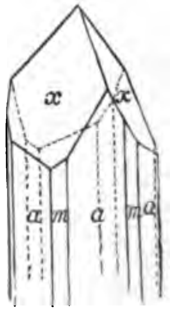

mine, New Mexico, with the new forms *z* (01$\bar{1}$1), *u* (2$\bar{1}\bar{1}$3), *v* ($\bar{1}$3$\bar{2}$5) (Fig. 1); colorless rhombohedral crystals (Fig. 2) from the Sedalia mine, Salida, Colo.; also pale-green prismatic crystals from Franklin Furnace, N. J. (Figs. 3, 4) with *h* (3$\bar{1}\bar{2}$0), *s* (11$\bar{2}$3), *x* (3$\bar{1}\bar{2}$1). Am. J. Sc., **47**, 305, 1894.

Etching-figures investigated, Traube, Jb. Min., Beil.-Bd., **10**, 463, 1896.

**Willyamite.** *E. F. Pittman*, Proc. R. Soc. N. S. W., **27**, 366, 1893.

Isometric: massive. Cleavage: cubic, perfect. Fracture uneven. Brittle. H. = 5·5. G. = 6·87. Luster metallic. Color between tin-white and steel-gray. Streak grayish black.

Composition a sulph-antimonide of cobalt and nickel, $CoS_2.NiS_2.CoSb_2.NiSb_2$. Analysis, J. C. H. Mingaye:

| | S | Sb | Co | Ni | |
|---|---|---|---|---|---|
| 1. | 15·64 | 56·85 | 13·92 | 13·38 | Fe,Cu Pb *tr.* = 99·79 |
| 2. | 15·92 | 56·71 | 13·84 | 13·44 | Fe,Cu,Pb *tr.* = 99·91 |

In the closed tube yields a dark red sublimate, orange on cooling; in the open tube sulphurous and antimonial fumes; also the latter on charcoal fusing to a globule. Decomposed by nitric acid with separation of antimony trioxide.

Found at the Broken Hill mines (in Willyama township), New South Wales, associated with dyscrasite in a gangue of calcite and siderite.

WINEBERGITE, p. 970.—Bodenmais, Bavaria, analyses, Thiel, Zs. Kr. **23**, 295, 1894.

WITHERITE, p. 284.—In parallel growth with barite, Mügge, Jb. Min, **1**, 252, 1895.

WOLFRAMITE, p. 982.—Occurrence in Bolivia, described by Frenzel, analysis by Sipöcz, Min. petr. Mitth., **16**, 256, 1896.

Occurs (C. H. Warren, priv. contr.) in Lawrence Co., South Dakota, in small brilliant black crystals (Fig. 1) in a highly siliceous matrix. Observed forms: *a* (100), *c* (001), *b* (010), *l* (210), *m* (110), *i* (7·11·0) new, *t* (102), *y* ($\bar{1}$01), *f* (011), *Δ* (112). The angles show a close agreement with those given for ordinary wolframite. B.B. the crystals show *no* reaction for manganese; they are hence inferred to be the pure iron tungstate.

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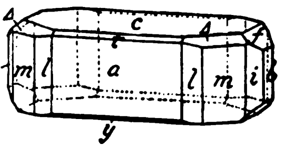

WOLFSBERGITE.—See *Chalcostibite.*

WOLLASTONITE, pp. 371, 1052.—Crystals from near Harrisville, N. Y., described, Ries, Trans N. Y. Acad. Sc., **13**, 146, 207, 1894.

New Hartford, Oneida Co., N. Y., shows strong greenish-yellow phosphorescence, Hillebrand, Am. J. Sc., **1**, 323, 1896.

Occurs, with gehlenite and hexagonal $CaSiO_3$, in slags from Přibram, Heberdey, Zs. Kr., **26**, 19, 1896.

An essential constituent in aplite from Quérigut, Ariège, Lacroix, Bull. Soc. Min., **21**, 272, 1898.

Crystals altered to pyroxene, Diana, Lewis Co., N. Y., C. H. Smyth, Jr., Am. J. Sc., **4**, 309, 1897.

WULFENITE, p. 989.—Cryst.—Jarilla Mts., Doña Ana Co., New Mexico, crystals hemimorphic (Figs. 1–3) with *p* (20$\bar{1}$) below only, while *c* (001), *u* (102), *e* (101), *n* (111), *π* (313) occur both above and below; *p* and *π* are new forms, C. A. Ingersoll, Am. J. Sc., **48**, 193, 1894. Loudville, Mass., habit varied, in part hemimorphic; new forms *θ* (1·1·12), *γ* (443), *λ* (131), Emerson,

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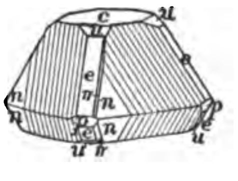

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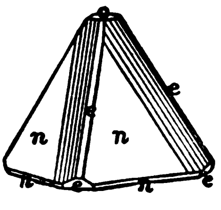

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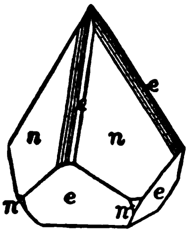


Bull. U S. G Surv., **126**, 176, 1895. Gorno, Val Seriana, Italy (with (5·1·75)?), Artini, Riv. Min. Ital., **16**, 25, 1896.

Etching-figures do not show hemimorphic symmetry, Traube, Jb. Min., Beil.-Bd., **10**, 457, 1896.

Observations on optical anomalies, A. de Gramont, Bull. Soc. Min., **16**, 127, 1893.

WURZITE, pp. 70, 1051.—Artif. cryst. described, Traube, Jb. Min., Beil.-Bd., **8**, 151, 1894.

XANTHOCONITE, p. 149.—Shown by Miers (Min. Mag., **10**, 185, 1893, and Zs. Kr., **22**, 433) to be monoclinic with the axial ratio, $\grave{a} : \grave{b} : \grave{c} = 1·9187 : 1 : 1·0152$, $\beta = 88° 47'$. Here belongs also rittingerite from Joachimsthal. Common forms: *c* (001), *m* (110), *d* (501), *D* ($\bar{5}$01), *p* (11$\bar{1}$), *q* (551), *P* ($\bar{1}$11), *Q* ($\bar{5}$51); also *a* (100), *n* (053), *r* (112), *t* (223), *h* (334), and on rittingerite *f* (115), *y* (443), *ρ* (332), *R* ($\bar{1}$12), *Y* ($\bar{4}$43). Angles $mm''' = 124° 56'$, $cd = 68° 14'$, $cp = 48° 32'$, $cP = 49° 10'$, $om = 89° 26'$.

Crystals tabular ∥ *c*, usually stout, again very thin; also massive, earthy. Twins: tw. pl. *c*, common.

Cleavage *c*, distinct. Fracture subconchoidal. Brittle. H. = 2–3. G. = 5·54. Luster adamantine to pearly. Color brown, orange-red; by transmitted light, lemon-yellow. Streak orange-yellow. Transparent. Optically —. Birefringence strong. Ax. pl. ⊥ *b* (010). $Bx_a$ nearly ⊥ *c* (001). 2E = 125° approx.; $\rho < v$.

Composition same as for proustite, $Ag_3AsS_3$ or $3Ag_2S.As_2S_3$. Analysis, Prior (corrected):

Freiberg, G. = 5·54 As 14·93 S 19·07 Ag 65·15 = 99·15

Xanthoconite occurs in calcite at Freiberg, Saxony, the original locality; also at Johanngeorgenstadt, Markirch in Elsass, Rudelstadt and Chañarcillo.

XANTHOPHYLLITE, p. 639.—*Waluewite*, Zlatoust, anal. and discussion of composition, Clarke and Schneider, Am. J. Sc., **43**, 379, 1892.

XENOTIME, p. 748.—Cryst.—Brazil, Hussak, Min. petr. Mitth., **12**, 465, 1892.

**Anal.**—El Paso Co., Colorado, Penfield obtained: $P_2O_5$ 32·11, $(Y,Er)_2O_3$ 67·78, ign. 0·18 = 100·07 (at. weight of Y,Er, 118); G. = 5·106, Am. J. Sc., **45**, 398, 1893. Analyses (Eakins) from the Brindletown gold district, Burke Co., N. C., green and brown var., Hidden, Am. J. Sc., **46**, 255, 1893.

Occurrence on New York island, Niven, Am. J. Sc., **50**, 75, 1895. In Calvin township, Nipissing district, Ontario (mass of 312 grams), Hoffmann, Rep. G. Canada, **9**, 13R, 1896. Distribution in European rocks, Derby, **11**, 304, 1897.

**Xiphonite.** *G. Platania*, Accad. Sc. Acireale, **5**, 1893.—See *Amphibole*, p. 3.

ZEOLITES, pp. 570–610.—Discussion of the composition of the species, F. W. Clarke, Am. J. Sc., **48**, 187, 1894. Bull. U. S. G. Surv., **125**. Also as to the part played by the water, G. Friedel, Bull. Soc. Min., **21** 5, 1898.

See also *Analcite*, etc.

ZINCITE, p. 208.—Franklin Furnace, N. J., hemimorphic crystals with *m* (10$\bar{1}$0), *c* (0001) and a pyramid *o* probably (20$\bar{2}$3), measured $co = 55° 38'$; analysis by Schütz gave: ZnO 96·20, MnO 3·33, $Fe_2O_3$ 0·43 = 99·96. Grosser, Zs. Kr., **20**, 354, 1892. Crystals from Franklin measured by Moses show two pyramids, interpreted as (40$\bar{4}$5) and (50$\bar{5}$4) if $\grave{c} = 1·6219$. School Mines Q., **16**, 226. 1895.

On artificial crystals, in part twins, Cesàro, Ann. Soc. G. Belg., **19**, 271, 1892 (abstr. Zs. Kr., **24**, 618). Also Ries, Am J. Sc., **48**, 256, 1894; Traube, Jb. Min., Beil.-Bd., **9**, 147, 1894

ZINKENITE, p. 112.—Crystals from Wolfsberg in the Harz show the form: *a* (100), *c* (001), *ϵ* (102), Spencer, Min. Mag., **11**, 188, 1897. He notes also relation in form to chalcostibite and other similar species. Cf. also Luedecke, Min. d. Harzes, 121, 1896.

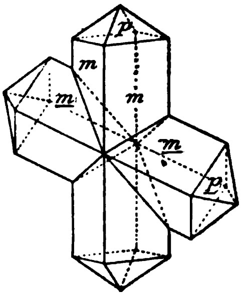
Occurs at Cinque Valle, Val Sugana, Tyrol, Sandberger, Jb. Min., **1**, 196, 1894. Also at Oruro, Bolivia (anal. by Mann), Stelzner, Zs. G. Ges., **49**, 86, 1897.

**Zinkmanganerz.** — *A. Brunlechner*, [Jb. Nat. Land.-Mus., Klagenfurt, **22**, 194, 1893,] Zs. Kr., **25**, 432. A hydrated compound of ZnO and $MnO_2$. Massive, compact; color dark brown or gray. Occurs with calamine at Bleiberg, Carinthia.

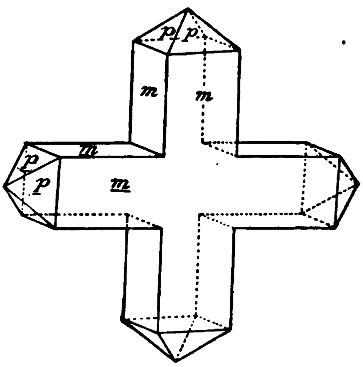
ZIRCON, p. 482.—Crystals described from the nephelite-syenite of Dungannon, Ont., Pratt, Am. J. Sc., **48**, 214, 1894. From Ilmen Mts., new forms (501), (643), (766), (545), Jeremejev, Vh. Min. Ges., **33**, 429, 1895.

Crystals from the Meredeth Freeman mine in Henderson Co., N. C., are cruciform-twins with the following twinning planes: *e* (101) Fig. 1, *p* (111) Fig. 2, *d* (558) Fig. 3, *φ* (774), *v* (221), *u* (331), Hidden and Pratt, Am. J. Sc., 6, 323, 1898.

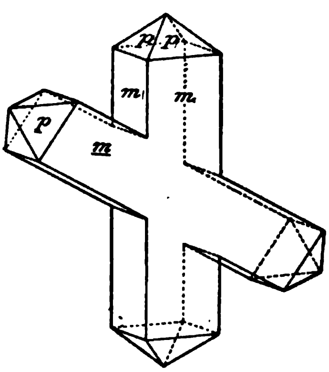
1.



2.



3.



Occurs in the Toluca meteoric iron, Laspeyres, Zs Kr., **24**, 485, 1895.
Synthesis, Khrushchov, Jb. Min., **2**, 232, 1892.
Analyses of cyrtolite from Mt. Antero, Colorado, Genth, Am. J. Sc., **44**, 387, 1892.

**Zirkelite.** *E. Hussak* and *G. T. Prior*, Min. Mag., **11**, 86, 1895; *G. T. Prior*, *ibid.*, **11**, 180, 1897. *E. Hussak*, Min. petr. Mitth., **14**, 408, 1894.

Isometric. In octahedrons, sometimes with cubic faces; crystals flattened and striated ∥ *o*, due to polysynthetic twinning. Spinel twins common, also fourlings.

Cleavage none. Fracture conchoidal. Brittle. H. = 5·5. G. = 4·706–4·741. Luster resinous. Color black. Nearly opaque; dark brown and isotropic in thin splinters. Non-magnetic.

Composition, $RO.2(Zr,Ti,Th)O_2$. Analysis, G. T. Prior, l. c., p. 180 (also an approximate analysis in p. 88):

| | $ZrO_2$ | $TiO_2$ | $ThO_2$ | $Ce_2O_3$ | $Y_2O_3$? | $UO_2$ | FeO | CaO | MgO | ign. |
|---|---|---|---|---|---|---|---|---|---|---|
| G. = 4·741 | 52·89 | 14·95 | 7·31 | 2·52 | 0·21 | 1·40 | 7·72 | 10·79 | 0·22 | 1·02 = 99·03 |

Found with baddeleyite, perovskite, etc., in the decomposed magnetite-pyroxenite of Jacupiranga, S. Paulo, Brazil.

Named after Prof. F. Zirkel of Leipzig. The same name was earlier given (1887) to a rock by M. E. Wadsworth, cf. Am. J. Sc., **5**, 153, 1898.

ZOISITE, pp. 513, 1035.—Relation to epidote discussed with description of crystals from Zermatt and Prägratten, Weinschenk, Zs. Kr., **26**, 156, 433, 1896; see also *Clinozoisite.*

On the optical characters of ordinary zoisite (ax. pl. ∥ *b* (010), dispersion $\rho < v$ large), also those of "*β*-zoisite" (ax. pl. ∥ *c* (001), dispersion $\rho > v$ small, variable), and the relation of these varieties to each other, see Termier, Bull. Soc. Min., **21**, 148, 1898.

Occurs at Flat Rock mine, Mitchell Co., N C., with monazite and allanite, analysis by Eakins, W. E. Hidden, Am. J. Sc., **46**, 154, 1893 (in Bull. U. S. G. Surv., **113**, 111, 1893, same anal. credited to James's mica mine, Yancey Co., N. C.)

ZONOCHLORITE, p. 610.—See *Chlorastrolite.*

ZUNYITE, p. 436.—Occurs in minute tetrahedrons in an altered porphyrite near Red Mountain, Ouray Co., Colorado, Penfield, Am. J. Sc., **45**, 397, 1893. The mean of two analyses gave: $SiO_2$ 24·11, $Al_2O_3$ 57·20, $Fe_2O_3$ 0·61, Cl 2·62, F 5·81, $H_2O$ 11·12, $P_2O_5$ 0·64, CaO 0·11, $Na_2O$ 0·48 = 102·70 (deduct O 3·03) = 99·67. This confirms Hillebrand's results and the formula given in Min., p. 436.